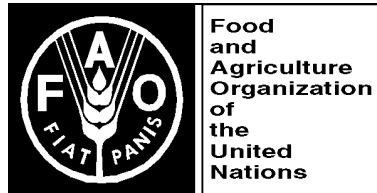


REU TECHNICAL SERIES NO. 54

BIOLOGICAL FARMING RESEARCH IN EUROPE



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Proceedings of an Expert Roundtable

**held in Braunschweig
Germany**

28 June 1997

**Rainer Krell
(Editor)**



**FOOD AND AGRICULTURE ORGANIZATION OF THE
UNITED NATIONS**

Rome 1997

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FOREWORD

This publication is the result of a long sequence of events which started with the FAO sponsored Expert Consultation on “Biological Farming in Europe” held in 1990 in Bern, Switzerland (REU Technical Series No. 12, Biological Farming in Europe, out of print), which was followed by the International Workshop on “Nitrogen Leaching in Ecological Agriculture” in Copenhagen, Denmark, 1993. Subsequently, in its reorientation towards broader environmental issues, the restructured European Cooperative Research Networks on Rural Energy (CNRE), since 1994 called the European Cooperative Research Network on Sustainable Rural Environment and Energy (SREN), which is part of the European System of Cooperative Research Networks in Agriculture (SCORENA), decided to form a research working group on biological farming. This finally resulted in commissioning the report: “Research on Biological Farming Methods in Europe; Perspectives, Status and Requirements”, both as a basic review and as a basis for deciding whether and in which area of the broad research area of biological farming the input from a SREN working group would be most beneficial to both FAO and the European research community.

This Report is included in its full length in these proceedings. The Roundtable Discussion, convened on 28 June 1997, in which six organic farming experts, four of the SREN coordinators and six other researchers, representing the European Research Network Advisory Committee (ERNAC) and FAO participated, concluded not only in agreement with the recommendations of the basic study by E. Wynen, but also in placing particular emphasis on the support for research network cooperation and creating a research working group within SREN under the theme of “Research Methodologies in Organic Farming”. The preference for this topic was agreed on considering the scope and possibilities of SCORENA, FAO’s role and benefits from such activities for other non-European countries, the complementarity of such an effort to existing activities and network structures and the important need for standardisation, communication and organization. Although the term ‘biological farming’ is used in the title of this and past publications, it is made clear in the Report that all references are to ‘organic farming’ as clearly defined by the International Federation for Organic Agricultural Movements (IFOAM) and the European Commission (EC).

It is hoped that this effort and initiative will not only find a good response among researchers, but also among the governments of FAO Member Nations to give it the small but significant support needed for success. Should it find the hoped for resonance, research cooperation on biological farming could develop into a fully established network under SCORENA.

It is strongly believed that even the relatively small action, such as the support of this working group, will significantly contribute to the growth of organic farming research which will inadvertently result in the improvement of productivity and quality in organic farming and of all marketing aspects of its products. The global acceptance of organic farming as a highly valuable contribution to improved sustainability of agriculture and to improved environmental conditions will be an important step to better food quality and ameliorated production methods.

M. Lindau
Regional Representative for Europe

ACKNOWLEDGEMENTS

I wish to acknowledge the financial support from the FAO Regional Office for Europe (REU) and the SREN Trust Fund which made the expert roundtable discussion and the preparation and publication of the proceedings possible. I would also like to thank the organisers of the meeting, N. El Bassam and E. Show of the Institut für Pflanzenbau, Bundesforschungsanstalt für Landwirtschaft, Braunschweig-Völkenrode (FAL).

I express my explicit appreciation to the author of the main report, Els Wynen and those who not only contributed to the roundtable discussion but also sent their written comments and suggestions: V. Lund, U. Niggli, J. Tyburski, R. Zanolli and K. Zimmermann. In addition, I thank those who made available their time and capacities for the reviewing of E. Wynen's report and coming together for the brainstorming session in Braunschweig: M. Arnoux, A. Bozzini, J. Chataigner, N. El Bassam, B. Geier, F. Höpner, S. Kyritsis, B. Müller-Haye, H. Nieberg, M. Reuss, P.

Weiland and M. Zjalic, which resulted in the recommendations and the formation of the SREN Working Group on “Research Methodologies in Organic Farming”. My thanks also go to Adrianna Gabrielli for editing the English and bringing everything into its final format.

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MINUTES OF THE EXPERT ROUNDTABLE DISCUSSION ON BIOLOGICAL FARMING RESEARCH IN EUROPE

Braunschweig, Germany, 28 July 1997

by R. Krell

The Meeting was sponsored by the FAO Regional Office for Europe (REU), as one of the activities of the Sustainable Rural Environment and Energy Network (SREN) on the occasion of the International Conference on Sustainable Agriculture for Food, Energy and Industry (22-28 June 1997, Braunschweig, Germany). The organiser, the Federal Agricultural Research Centre, and FAO invited seven experts, of which six were present. In addition, four SREN coordinators, the four members of the European Research Network Advisory Committee (ERNAC), a special adviser, an observer from FAL and a REU representative were present (see List of Participants attached).

The purpose of the Meeting was to follow up on decisions taken by the SREN coordinators in 1993 to establish a research working group on organic farming within their Network. Expected results were:

- 1) Recommendations to REU on the usefulness and scope of research cooperation in organic farming in a European context.
- 2) A decision on a subject area for the first SREN working group on organic farming.
- 3) An agenda for action.

A report was prepared by Els Wynen on "Research on Biological Farming Methods in Europe, Perspectives, Status and Requirements" as a basis for discussions and was distributed to all participants before the Meeting. Each expert presented a short review of their institution's and/or country's research efforts on the topic plus comments on the conclusions and recommendations of the above-mentioned Report. These comments are presented separately. The Report, Comments, Minutes and Conclusions are planned to be published as REU Technical Series No. 53 and will be included on the REU WWW pages.

After a brief introduction of all the participants, the Chairman, R. Krell, FAO/REU, briefly presented the programme of the day and the background and objectives of this Meeting. Five of the seven invited experts' brief presentations which followed, are reproduced here after E. Wynen's Report (K. Zimmermann, U. Niggli, V. Lund and R. Zanolli). At the last minute, due to family reasons, J. Tyburski was unable to attend. His report and comments were forwarded to the meeting by fax.

It was apparent from the main Report and all comments received, that basically everyone agreed on the need for better collaboration between researchers in this field. Everyone also agreed that a full-fledged ESCORENA network or at least a working group within SREN, is very much needed and highly welcomed. FAO was seen as being able to play a major role in the European Region as well as globally, although some network activities already exist in certain fields, such as economics, extension education, publication database, etc., which are or are expected to be supported by the EU.

In addition to providing extra information on organic farming research in Scandinavia, the Netherlands, Switzerland and Central and Eastern Europe and on ENOF activities, the presentations also showed a principal **agreement with the recommendations made in E. Wynen's Report**, particularly those of direct interest to FAO. The comments mainly further emphasised one or the other recommendation of the Report and different research priorities according to regional or country priorities. Among them, the value of comparative studies for economic research was mentioned.

For a while discussions focused on some of the major research areas in need of increased research attention, e.g. those with relative long-term investments like animal husbandry and fruit cultivation, but also vegetable growing, important from the consumption point of view. Marketing and quality assurance were mentioned as other important subject areas. While the need for increased cooperation in each area was apparent, two overall concerns crystallised: 1) the need for peer reviewed publications (in independent journals or in established scientific journals) and 2) the facilitation of the special needs of organic farming research, i.e. whole farm system experiments and above all, an holistic, interdisciplinary experimental design requiring in-depth horizontal collaboration and special methods.

It was also mentioned that researchers in many specific subject areas were already connected to a certain degree and therefore these specific subject areas may not be the area of largest need. There is much talk about holistic approaches in organic farming, but is it already an holistic approach if soil scientists are talking with economists? With research now also starting in government and university research stations as compared to exclusively in private institutions only a few years ago, the discussions on defining an holistic approach are of increasing importance. However, they are of a methodological nature. A wide range of researchers are interested in specifying the special qualifications for research in organic farming.

Discussions briefly focused on the non-technical areas of social, economic and ethic concerns in an holistic approach. None could be left out, but it was agreed that none of them should be the focus of a working group agenda at this point in time. In this context, ERNAC members reminded participants to consider the research nature of the cooperative network system.

Discussions continued on the need for on-farm research and special extension and training needs. In an holistic approach, which "generally goes a little beyond the classical Gallilean approach", it is sometimes difficult to also incorporate the classical elements of repeatability, representability and comparability. Since the holistic and interdisciplinary approach and particularly the former, include a larger human element of interpretation of research results, i.e. different perceptions from different scientists, a uniform, agreed methodology takes on a more important role.

It was mentioned that the question of methodology, i.e. standardisation of results and reporting, in an holistic and interdisciplinary approach, was to have been discussed by the ENOF network during their last workshop. In the end, precedence was given by ENOF to market issues and matters of higher concern for general agriculture and food policy. Scandinavian researchers in their newsletter had also expressed increasing interest in discussing the methodology issues.

It was then agreed that methodology and standardisation of research networks are a pan-European problem even if the research fields of highest interest may differ between north and south and east and west.

The suggestion to form the first initiative on "**Research Methodologies in Organic Farming**" with the purpose of identifying, defining and standardising research methodologies for an holistic, interdisciplinary approach to organic farming, was unanimously accepted and supported.

After agreement on the topic and need for future collaboration, the agenda and contributions from those present were discussed, i.e. procedures, timetables and responsibilities were clarified and established.

The following agenda was decided upon with the agreement of all the ERNAC members and SREN coordinators.

It was agreed that:

- A new working group will be formed as part of SREN on the above-mentioned topic.
- A first workshop of this working group will be held in the first half of 1998.
- During this workshop a more detailed programme will be decided upon and a working group coordinator will be elected.
- During this workshop the formation of a network or the continuation as a working group will be discussed.
- The ECA be informed (preferably in October 1997) of this decision and of the perspective that this initiative might develop into a new network.
- The ECA be informed that financial commitments from Member Governments are necessary.
- All experts present, participate in the preparation of the workshop by contacting potential participants, suggesting to REU and the focal point people who may be interested and by working out a more detailed programme for the first meeting.
- R. Krell would write the minutes of this Meeting and circulate them for comments.
- A letter be drafted by REU with comments from the coordinator/focal point to inform everyone of this activity and its purpose, expecting a response and comments.

R. Krell asked for a volunteer to act as coordinator/focal point for the time being to receive the responses and draw up a summary and prepare a request to FAO/REU for the establishment of this new working

group, describing its purpose, interest in the scientific community and first programme suggestions. R. Zanoli volunteered after the exact responsibilities had been clarified, namely:

- commenting on a draft information letter;
- receiving answers and preparing a “database”/address list; and
- serving as a kind of “mailbox”, correspondence point/focal point external to FAO/REU pulling the strings together.

The Secretariat (REU) will prepare responses to the information letter where necessary.

It was recommended by all participants that FAO/REU fully support this initiative in view of the great need and benefit that this collaboration will bring to all organic farming research and consequently to more sustainable agricultural practices in Europe and worldwide.

It was then requested that since it is intended to publish E. Wynen’s Report, the Expert Contributions, Comments to the base report, and these Minutes as a REU Technical Series and as a WWW page and in view of the fact that the Report should be finished in time to present it at the European Commission on Agriculture (ECA) Meeting to be held in October 1997, that all comments and contributions be sent to REU by 15 July 1997. Comments should be very short, one or two pages, just listing the major points and not be written in scientific publication format. They may also include, now that the topic has been decided, suggestions on specific activities such as sub-topics, newsletters, workshops, seminars, internet, etc.

The Chairman then thanked everyone for their efforts of putting their minds together and being present at the Meeting. He expressed his satisfaction with the outcome of the discussion and his pleasure that such a clear topic and research focus was found which does not exclude any special field of interest from the outset but is not too broad to include all technical specialities. He felt that it is a very workable proposition, through which a great contribution can be made to the progress of organic farming research in Europe and globally, in which all other existing initiatives can collaborate and which can be of great benefit to FAO in its efforts to increase sustainability of agriculture worldwide.

He was also pleased that the SREN coordinators, who initiated the opening of the network to organic farming, and the ERNAC members, who advised on the best approach and procedures, were present at this important meeting.

Finally, he expressed his optimism that with the volunteer spirit and goodwill of this group, which have also been the main driving force behind all organic farming developments in the past, this working group and a possible future network will be off to a very strong and positive start.

SUMMARY OF RECOMMENDATIONS

Recommendations summarised from the Report of Els Wynen

1. To increase sustainability and food security, organic agriculture, being a proven production method with many benefits which cannot or are difficult to provide with conventional agricultural methods, need to be given serious and much wider attention for research and education to permit farmers everywhere, an informed choice from ALL available agricultural methods.
2. FAO should increase visibility and credibility of proven organic methods by giving particular support to activities such as points 3, 6, 7 and 8 below.
3. Network cooperation on selected subject areas should be promoted by FAO not only for research, but also for extension and inspection services.
4. FAO can make a leading contribution to standardisation of comparable data collection which will be of great benefit to researchers, extensionists and producers.
5. An expert list with specific focus on FAO collaboration in developing countries should be assembled.
6. FAO should include data on organic agriculture production and trade in its annual statistics.
7. Quality and other parameters for organic products should be included in the Codex Alimentarius.
8. Technical consultations and meetings focusing in part or as a whole on organic farming practices should be organized with joint support from FAO, national and international research institutions, NGOs and IGOs.
9. FAO should, through better collaboration with NGOs and research institutions, use its excellent information distribution system to disseminate special studies, research results and practical advice on organic agriculture.
10. FAO should include in all its activities and assistance programmes (technical, finance and policy) a serious evaluation of sustainability and environmental impact to compare conventional to non-conventional agricultural methods, such as organic agriculture, not only in its individual elements but also as a whole system.

Principal recommendations from the Expert Roundtable in addition to those from the Report, which were accepted as presented in the Report of Els Wynen

11. FAO and SREN should establish a research working group on "Research Methodologies in Organic Farming" for the purpose of identifying, defining and standardising research methodologies for an holistic, interdisciplinary approach.
12. FAO/REU should give full secretarial and financial support to the agreed agenda of the SREN working group and its future programme activities.
13. Considering the increasing significance and special needs of organic farming, i.e. whole farm system experiments and above all an holistic, interdisciplinary experimental design, the establishment of a full fledged research network under ESCORENA or other FAO programmes should be urgently considered.

RESEARCH ON BIOLOGICAL FARMING METHODS IN EUROPE PERSPECTIVES, STATUS AND REQUIREMENTS

by Els Wynen

Executive Summary

The importance of organic agriculture in the European agricultural sector is growing and has been doing so especially since the early 1990s. The total area under organic production in Western Europe has increased from just over 100 000 hectares in 1985 to more than ten-fold a decade later. Some countries, especially the German-speaking and Scandinavian countries, are now showing a rate of growth which takes the organic industry out of its marginal position and transforms it into a more generally accepted form of agriculture. Central and Eastern Europe, where figures from only the last few years are available, shows a similar trend.

This growth is partly due to the change in policies which makes organic agriculture more attractive to farmers at present than in the past. The growing realisation that agriculture has a major impact on environmental quality has been an important motivation for this change. Perhaps the clearest indication of developments in the area of organic agriculture in the future is the move by some local authorities to encourage (Munich, Germany) or compel (Brittany, France) farmers to change to organic agriculture, in a bid to maintain or improve the quality of drinking water. Several national governments have allocated funds for conversion, marketing activities and research into organic production methods.

Research has played a significant role in the development of organic agriculture. In the past, when most research was carried out by farmers and some private research institutions, a large part of this research was directed to the physical aspects of crop production, with considerable emphasis on soils. Originally, comparing organic and conventional farming was perhaps mainly carried out to convince others that organic agriculture was worthy of attention. More recently, such studies have been used to analyse policies and optimal policy directions. Influencing consumption of organic products by promotion, improving information on product quality and decreasing marketing costs, is only just starting to be perceived as rather important in the progress of organic agriculture. Also other areas, such as animal husbandry and horticulture (fruit), have been somewhat neglected in the past, possibly indicating the degree of difficulty of coping with problems under organic management in these particular sectors. Although it was realised early on that one of the advantages of organic agriculture was the decrease in off-farm pollution, this aspect of farming has never received attention in much more than qualitative terms. Once organic agriculture reaches a certain stage of acceptance, as in Austria which officially recognises organic agriculture as the form of sustainable agriculture, attention is also given to the larger issues of other effects on the country, such as energy use and regional effects. This is perhaps also the time when the need for a restructuring of the whole infra-structure of research (such as interdisciplinary activities and long-term approaches) is acknowledged.

The most important barriers and problems for the advancement of research in organic agriculture were considered by respondents to a questionnaire (all Europeans) and by participants of a workshop in the US to be institutional rather than technical. The main barriers mentioned were the present structure of research funding; the different requirements in organic agriculture leading to rather expensive research; lack of a united front by the organic sector; absence of networks by researchers in organic agriculture; relative lack of good researchers and inadequate structure to foster them (by good supervision of potential researchers and peer review); and lack of policies which encourage research in organic agriculture directly or indirectly. For Central and Eastern Europe, the absence of legislation was also considered a problem, and the fear that pressure from outside (such as foreign private industry) may convince farmers and policy makers that the use of fertiliser and pesticides is the only way to progress in farming.

In its task to foster long-term environmental sustainability in agriculture and food security, FAO has great cause to be interested in and to promote organic agriculture. Not only should the greater European experience in organic agriculture be acknowledged and supported, but also the available knowledge ought to be more actively integrated in other FAO policies and programmes. To enable farmers in developing countries to make informed choices requires that FAO provides information on 'alternative agricultural methods'. To do this, new programmes emphasising organic farming methods should be carefully integrated with existing activities. Successful and widespread adoption of organic methods would provide developing countries with a sustainable agricultural basis without the legacy of harmful environmental degradation that has been a feature of agriculture in many developed countries.

1. Introduction¹

This Report was written for the Regional Office of Europe (REU) of the Food and Agriculture Organization of the United Nations (FAO) which supports ESCORENA², a European Network System for the promotion of research cooperation, particularly in the field of sustainable agriculture.

The Sustainable Rural Environment and Energy Network (SREN), which is part of the ESCORENA Network, in 1993 suggested an expansion of its environmental focus by including research on certain aspects of biological farming. In this context, REU commissioned this Report to review the current situation in order to:

‘provide a working document with sufficient information and recommendations to permit FAO and research experts to evaluate the need and possible focus of an ESCORENA research network or other support on biological farming methods, which can be provided by FAO and be of benefit to FAO.’

For more details on the terms of reference, see Appendix A.

Possible future network activities are expected to also be of benefit to FAO in terms of input into related FAO activities in sustainable agriculture, food security and biodiversity.

In order to put research on biological agriculture into perspective, especially for those who are unfamiliar with the topic, Section 2 reviews the relevance of biological farming methods for agriculture, environment, economy and society in Europe, and its global significance.

This general section is followed by:

- a review of past and present research activities, priorities and trends;
- a discussion on special research issues of importance and relevance in support of improvement of biological farming practices;
- a discussion of present barriers and problems for the advancement of research in biological farming; and
- an analysis of present and future needs of researchers.

The question is then what kind of cooperation can help in overcoming at least some of the problems in order to promote research in the future. These issues will be discussed in the last section.

2. Review of biological farming methods

2.1 What is biological agriculture?

In this Report only those forms of agriculture which are covered by the European Union’s Council Regulation EC No.2092/91 (EC, 1991) are discussed. In 1991, the then European Committee regulated the concept of biological agriculture with member countries having to specify which word they wanted to use. For example, in Dutch, French, Italian and Portuguese, the word similar to ‘biological’ was reserved for use in this context, in Danish, German and Spanish, the word ‘ecological’ was chosen, and in English ‘organic’. Hence the word ‘organic’ is generally used in this Report.

¹ Rainer Krell conceived the project and provided comments during the different stages. Many people working in organic agriculture spent time in describing their knowledge of and experiences in organic agriculture. Vonne Lund gave feedback on an earlier draft of the Report. The author thanks these and others for their time and energy.

² The European System of Cooperative Research Networks in Agriculture (ESCORENA) was established in 1974 and consists of 13 different networks. It promotes

‘...cooperation in research, exchange of information and transfer of know-how and methodology advances with clear sustainable development and socio-economic implications. Within these objectives the following are included:

- collaborative research projects;
- network consultations;
- meetings and workshops of working groups and sub-networks; and
- documentation.

Whenever a need arises and financial resources are available, other cooperative activities are undertaken such as training courses, study tours and exchange of materials and experts.’ (FAO 1996a).

In the above-mentioned regulation the word 'organic' was defined and standards for organic production were set. This was done in cooperation with the International Federation for Organic Agricultural Movements (IFOAM). The EU standards were based to a large extent on the IFOAM standards. The regulation required that each member state guarantee that what they traded under the name 'organic' was indeed produced according to the specified standards. Those forms of agriculture which do not comply with those standards, for example, those based on so called 'integrated methods', such as reduced input methods and integrated pest management techniques, cannot be called organic and therefore are excluded from this study. It is to be noted that the standards relate to the system of production, not to the end product *per se*.

2.2 Significance of organic agriculture

Before the 1990s, the area under organic management and number of organic farmers represented less than one per cent of the total agricultural sector in most countries. Since that time the situation has changed with some countries expanding organic agriculture considerably. Total certified and in-conversion areas in Western European countries grew from approximately 114 000 ha in 1985 to just over 250 000 ha in 1990, but have almost reached 1 250 000 ha in 1996 (see Figure 1). The number of farms increased from approximately 7000 via 14 000 to 55 000 for the same years, as shown in Figure 2. Although the average 1996 figures for Europe still indicate less than one per cent of area under organic management as compared with total area under farming in 1993, there are several countries where these figures are higher, notably in the German- and Scandinavian-speaking countries. In the country with the largest increase in organic farming, Austria, both areas under organic production and number of farmers were around seven per cent in 1996 (N. Lampkin, University of Wales, Aberystwyth, personal communication, April 1997).

In Central and Eastern Europe, where data have been available only in more recent years, the trends are similar. The area under organic management more than doubled in the last three years, totalling 94 000 ha in 1996. The number of organic farmers grew at a slightly slower rate, indicating larger farms becoming involved in organic agriculture.

The average annual growth rates of area under organic management in the EU over the last five years was almost forty per cent, considerably higher than over the last ten years, when the average was around twenty-five per cent. Recently, the growth rate has slowed down again as it dipped just under the ten year average in 1995, although increasing again (to over thirty per cent) in 1996.

The changes are occurring under the influence of a number of factors, related both to market and regulatory conditions (see also Hamm and Michelsen (1996) and Lampkin and Weinschenck (1996)). The importance of each factor differs between and even within countries. The main factors include:

- the provision of subsidies, especially in the areas of:
 - conversion
 - marketing (licensing scheme, consumer education)
 - information: research, education and extension
- changes in consumer behaviour:
 - increasing demand which, through firmer and more stable prices and a reduction in risk for producers, stimulates supply.

In the 1980s, government assistance in the form of establishing an organic certification scheme occurred in a number of European countries. Subsidies for education (with professorial chairs in organic agriculture) and extension services were other areas of government assistance. More recently, subsidies for conversion to organic methods were introduced. The EU agri-environmental programmes (Regulation 2078/92) also cover both conversion to, and continuation in, organic agriculture (Lampkin and Weinschenck, 1996).

A number of countries have found it important to set a goal for the growth of organic farming in the future. For example, in Sweden, Parliament resolved to aim for ten per cent of total farm area to be under organic management by the year 2000 (Ecology and Farming, 1994). In Denmark, the Ministry of Agriculture, in its plan of action for the promotion of organic production, foresees fifteen to twenty per cent of domestic market share for organic products in the year 2000, resulting in a seven per cent share of Danish agriculture at that time. Members of the Council responsible for the document have expressed views that this could well increase to between twenty and forty per cent by the year 2010, with a long-term goal of all

agricultural land being farmed organically. In the document, policy strategies are proposed to effect this development (Danish Ministry of Agriculture and Fisheries, 1995). In Austria, in the early 1990s, 'sustainable agriculture' was declared to mean organic agriculture.

Reasons for such goal-setting by politicians include pressure from consumers and from voters who care about environmental quality; a wish to curtail over-production; and perceived marketing opportunities for conventional farmers by showing that the agricultural sector as a whole is moving towards environmentally-friendly practices.

There is little doubt that goals are translated into policies which are at least sympathetic towards organic agriculture, if not positively stimulating. For example, in Denmark, approximately US\$150 million was allocated to the development of organic farming between 1995 and 2000, increasing from US\$18 million in 1995 to over US\$30 million in 1999 (Danish Ministry of Agriculture and Fisheries, 1995). It is likely that these differences in policies account for at least part of the variation of adoption rates in the different countries.

Apart from a change in composition of farming systems, the developments in organic agriculture have also had an effect on research in conventional farming. Niggli and Lockeretz (1996) mention advantages in the area of perceptions of researchers in conventional farming such as an easier acceptance of:

- alternative solutions to problems, that is, a widening of researchers' horizons;
- acceptance of the notion that farmers can also be a source of invention; and
- awareness of the importance of biological and environmental processes in agricultural production, despite the possibilities of heavy technological intervention.

As in some countries conventional farmers see organic managers as the early adopters of a new technology (V. Lund, editor of 'Research Notes on Ecological Agriculture in Nordic Countries', personal communications, May 1997), research results in organic farming are presumably closely monitored by those who hold that opinion. It is then perhaps not too far-fetched to imagine that questions from this group of farmers to researchers in conventional agriculture would affect the direction of research generally.

Implications of developments in organic agriculture can also be seen in tendencies in conventional agriculture towards:

- reduced input use:
an increased sensitivity to off-farm cost of production resulting, amongst others, in research into decreased chemical inputs and livestock units per area unit;
- changed production:
changes in crop rotations and yield levels, where they occur, will cause changes in payments such as export subsidies. The direction of the change will depend on the particular product.

2.3 Environmental considerations

The body of literature on problems caused by agricultural practices is substantial and growing. This literature indicates that problems can be due to the use of certain specific inputs (for example pesticides and fertilisers) which differ between farming systems, or to the effect of the system as a whole (for example, intensification and specialisation increasing the risk of soil degradation). A few examples follow.

In an early study the 'indirect costs' of the use of pesticides in The Netherlands was estimated to amount to between forty and eighty per cent of the total direct expenditure on chemicals (Eitjes and Den Haan, 1987). With more intensive use of pesticides over the years, this percentage is likely to have increased. More recently in the USA, estimates of the total 'indirect' private and external (off-farm) costs (excluding the input price) of the use of synthetic pesticides were calculated to amount to US\$8.1 billion annually, US\$5 billion of which were environmental and public health costs. This compares with a total annual expenditure of US\$4 billion on pesticide treatments including materials and application (Pimentel *et al.* 1993), so that the non-material costs of pesticides was estimated to be twice as high as the costs of the pesticides themselves. Effects on the environment include those on human health (although not those on the immune system, a relatively new area), ground and surface water, birds, bees, fisheries and pesticide pollution control. Loss of biodiversity is also an area which is accepted by many as a consequence of pesticide use, but is rarely quantified.

In a recent study, FAO (1996b) estimated the average cost of reducing pollution in the production of different vegetable oils, soybean, palm, rape-seed and sunflower and compared this with production costs. The increase of production cost of soybeans resulting from a fifty-five per cent reduction in pesticide pollution (including herbicides) was calculated at US\$231 per tonne. Comparing this with the cost of materials used in the production process in the USA (including, apart from pesticides, fertilisers, seeds, etc. and amounting to US\$132 per tonne), this showed an increase in cost of 175 per cent; that is, the cost of materials increased to nearly three-fold to reduce pollution by just over half. The lowest relative cost increase was calculated for rape-seed oil at twenty-eight per cent of materials used (in Germany). Pollution control costs for palm oil (produced in Malaysia) was estimated at thirty-six per cent and for sunflower oil (France) at over 120 per cent.

The effect of agriculture on water quality is increasingly acknowledged. Although few studies quantify the costs, some results are available. In England and Wales alone, the cost of measures to regulate and remove pesticides from UK drinking water is estimated to be around US\$200 million annually, with over US\$1.6 billion in initial investment costs. To control and abate nitrate pollution of drinking water, costs were calculated at around US\$40 million per year (1996-97), with up to approximately US\$450 million in total costs of initial investment in water treatment equipment and control measures since 1989 (Redman, 1996). In Germany, the Department of Works pays farmers in certain areas to convert to organic agriculture in a bid to maintain Munich's drinking water quality (Heid, 1997). In Brittany in Northern France, Egmont-Florian (1997) reports that whole valleys are compelled to convert to organic management, as the drinking water quality was found to be unacceptable.

Concerns about the effects of applications of fertilisers and pesticides used in conventional agriculture are not confined to proponents of organic farming. The rise of environmentalism as a political force in a number of countries can be seen as a sign of this concern. For example, in The Netherlands, the quantity and timing of applications of agricultural nutrients have been restricted and the pesticide reduction schemes in Denmark, The Netherlands and Sweden are to a large extent a consequence of growing awareness. Under the EU Regulation 2078/92, certified organic farmers are entitled to payments on the basis of their management system, signifying that organic agriculture is considered as a means of reducing environmental problems.

Soil degradation is the topic of a large body of literature and widely recognised to be related to farm practices. The US National Research Council (1989, p.115) discusses on-farm and off-farm damage caused by soil erosion, which is attributed to 'Common management practices such as increased reliance on row crops grown continuously, fewer rotations involving forages and larger farms being tilled by one operator...'. It includes federal farm programmes which encourage '... levels of production that work as a disincentive for effective erosion control practices.' In connection with specific differences between conventional and organic farming, Hodges and Arden-Clarke (1986) illustrated the connection between general farm practices and soil degradation in the UK, concluding that '... organic/biological farming can be shown to be a soil-conserving system' (p.33). At a more micro-level, Reganold *et al.* (1995) showed differences in soil quality between conventional and bio-dynamic farms in New Zealand, with the latter having a better biological and physical quality.

In a study on the influence of the production system on the atmosphere Vogtmann, Zehr and Simon (1996) conclude that organic agriculture can contribute substantially to a reduction in negative climatic impacts. This is attributed to a considerably lower use of 'indirect energy' in organic agriculture, that is, energy needed to produce agricultural inputs, such as synthetic fertilisers.

2.4 Economic and social implications

The case of moving towards organic agriculture brings up the question about costs and benefits to the farmer and to society. A number of studies have been conducted on these variables, many of which can be found in Lampkin and Padel (1994). Although it is often assumed that organic agriculture brings with it financial problems for farmers, experience does not bear this out. The main variables which influence this include: yields, input costs, total farm outputs and output prices.

Lampkin and Padel (1994) concluded that yield on organic as compared with conventional farms was related to the intensity of the conventional farming system. The more intense conventional agriculture, the larger the difference. Hence differences existed between:

- countries, where yields in Australia, Canada and the USA showed considerably less differences than those in Western European countries;
- crops, with greater differences for example in wheat yields than in yields of oats and field beans; and
- time, with absolute yield levels in organic agriculture increasing over time, but not as fast as in conventional agriculture, though changes in input costs were not included in the analysis.

It is also interesting to note that yields on organic farms were found to be significantly higher than those on conventional farms before the 1950s, thereby dispelling the notion that organic agriculture is going back to the old days.

Input cost is usually lower on organic farms, as expenditure for (organic) fertiliser and pesticides tends to be lower. Due to changes in crop rotations, the output mix changes as compared with conventional farming. The end-result is that relative returns vary. Location, enterprise and year can be important variables. Some results (expressed as farm returns minus variable and fixed costs), reported in studies in different countries, are as follows (see Lampkin and Padel, 1994):

similar or higher: Australia, Canada, Denmark, Germany, Denmark and the U.K. (Wales);
and lower: Switzerland, U.K. (Britain) and USA.

Results are also dependent on the time of research. Input and output prices change over time, and are likely to reflect the total (including environmental) cost of production more accurately in the future than they did in the past. This will influence relative farm profits.

There are usually costs attached to converting to organic agriculture, partly due to initial inexperience of the farmer; the biological processes on the farm which need time to develop; the difficulty of obtaining premiums in the conversion time; and the need for new investments. For enterprises with the most intensive production activities, conversion might not always be financially acceptable with present input and output prices. Conversion costs are generally recognised by many countries in Western Europe providing conversion subsidies, which are often somewhat higher than subsidies for established farmers.

When a large number of farmers moves towards organic agriculture it can be expected that a number of variables change, thereby affecting the profitability of organic farming. The first variable often mentioned is output prices. Many expect that with many farmers becoming organic, supply of organic products increases relative to demand, so that premiums erode, making organic farming unprofitable. This neglects the possibility of a shift in demand for organic products. Other changes could include those in input prices, when increased demand causes higher prices. Alternatively, economies of scale can cause a decrease.

Estimates of the effects of a substantial shift towards organic farming differ greatly. Some studies carried out in the USA around 1980, though diverging in many aspects, agreed that lower product quantities would be available for export leading to higher export earning (due to inelastic demand) and possibly higher farm incomes (Olson, Langley and Heady, 1982; Langley, Heady and Olson, 1983). From later studies, mentioned in Lampkin and Padel (1994), those which included farm incomes tended to show reduced incomes under organic management, especially when no premiums were allocated. Where employment was included, opportunities increased or decreased less than under conventional agriculture. A recent study for Australia (Wynen, 1997) found that, with a change of thirty per cent of cereal-livestock farmers to organic management, returns to the farming community would be reduced by less than three per cent, even under present pricing conditions. In Finland, a change towards organic agriculture was reported to be financially less rewarding only in the pig and vegetable industries. For all other enterprises, the returns to farming were estimated as being comparable to those in conventional agriculture, even without output premiums (Miettinen *et al.*, 1997). These studies are carried out under present conditions, where environmental costs (including human health and landscape value) are not incorporated in the input and output prices.

To summarise, results of studies on financial consequences of organic farming and on the effect of a large-scale change towards organic agriculture, differ considerably. However, there is sufficient evidence to conclude that a change towards an organic management system does not necessarily result in financial problems for the farmer. For the whole farming sector, the situation is more complicated, although also here, predictions of financial disasters are not evident. No doubt, research in this area is likely to increase over time.

3. Past and present research activities, priorities and trends

3.1 History

From early this century, research and extension activities in organic farming have been carried out by individuals amongst whom there are prominent names such as Steiner, Howard, Balfour and Rodale. Groups of individuals then started to combine in organizations, often consisting of farmers and some interested researchers; and private research stations were founded, of which the main ones in Europe are:

- Institute for Bio-dynamic Research, Germany (1950);
- Research Institute for Biological Agriculture, Switzerland (1974);
- Louis Bolk Institute, The Netherlands (1976);
- Ludwig Boltzman Institute for Biological Agriculture and Applied Ecology, Austria (1980);
- Elm Farm Research Centre, England (1982); and
- Norwegian Centre for Ecological Agriculture (1987).

Some of these institutions now receive part of their income from government sources.

In their article on the development of research in organic agriculture, Niggli and Lockeretz (1996) mention concern for soil health and fertility as reasons for interest in organic, as opposed to industrial (conventional), agriculture from early in the 20th century, leading to research in soil ecology. Woodward, Flemming and Vogtmann (1996) add the human health aspect to it, as ‘...the health of soil, plant, animal and man is one and indivisible’, quoting Balfour (1975).

By the second half of the 1970s enough critical mass had accumulated for a scientific conference on organic agriculture. The first conference of IFOAM took place in Switzerland in 1977 and its aim was to provide an overview of research in organic farming. Ever since, a biennial conference has been held. The last one was in Copenhagen in August 1996, at which close to 400 papers were presented.

One of the signs of acceptance of organic agriculture by the public sector was the establishment of professorial chairs, the first two in Germany (Kassel) and The Netherlands (Wageningen) in 1981. Other countries followed, Austria, Finland and Sweden with one each, and an expansion to six in Germany. Denmark has recently appointed the first professor in organic agriculture, and is presently in the process of appointing a second. Norway has also decided to establish a chair in this field. Some would say, however, that this was more window dressing than a real interest by the mainstream research community in organic agriculture. In the meantime, courses in the topic expanded, both at tertiary and secondary educational level, in a number of countries (see Mansvelt and Koelster, 1990). These developments occurred often as a reaction to pressure from different groups, such as students and the environmental movement, while an increase in demand for organic products showed another group expressing their interest in that direction. In some cases implementation of a course depended on particular people with interests in teaching these topics, sometimes even disguising the content behind a different name to ensure acceptance by management.

Ministries of agriculture in many countries started to show an interest in the 1980s, some setting up extension services for organic farmers (for example in The Netherlands), others getting involved in other aspects, such as setting up an organic certification scheme (as in Denmark). At present, involvement in many countries is through applied research (research stations) and extension. For example, around 200 organic advisers were employed in Germany in 1996, either by producer organizations or by the state (Ecology and Farming, 1996). However, state interest does not occur in all countries. Especially in the Southern European countries, little government interest was reported although regional differences can be large. Some Eastern European and Baltic states reported a poor infra-structure for organic agriculture including a lack of organic farmers’ associations; certification systems including no legal status for the word ‘organic’; marketing institutions; and training and research.

Private consultants have also appeared on the organic scene. As they often do not get paid for their services from public money they have to recuperate their costs from the clients. Many consultants in organic agriculture therefore work directly with farmers and often with those who are in the conversion stage.

3.2 Research topics

3.2.1 Before 1990

In the 1970s, a lot of research on organic agriculture was carried out in the form of comparisons between organic and conventional agriculture. At that stage it seemed important to establish that organic agriculture indeed was financially feasible without exhausting soil fertility and without the farm, or that of the neighbour, being overrun with pest problems (including diseases, weeds, insects). In the early 1980s, organic researchers gathering in Sweden decided that it was time to stop trying to prove that organic agriculture was possible and that now the scarce resources available to research in that area should be put into looking at how organic agriculture could be made to work best and not whether it worked (Dlouhy and Nilsson 1983). Despite this resolution, comparisons did continue in many countries.

In a report on research in organic agriculture in Austria, Denmark, Finland, France, Germany, Norway and Sweden, Höök (1997) mentions that in the 1980s the emphasis was on solving short-term production problems. Niggli and Lockeretz (1996) write that generally applied technical research has been and still is, favoured by farmers. This applied research concentrated on soil aspects with research into effects of rotations; materials such as ground rock; and animal manure and compost (which includes quality, storage, ease of spreading etc.). Pests and diseases were generally considered to be a direct reflection of the soil quality and received therefore less attention in research, at least in agricultural crops, although they have been a major area of investigation in horticulture. Weed problems have always been of considerable interest, where crop rotations (including the use of animals), timing of operations and mechanical means (including flame weeders) have had major attention. Research into animal production concentrated on nutrition, housing, breeding and veterinary medicine. However, this area has been somewhat neglected in the past. For example, Boehncke and Krutzinna (1996) report that only six per cent of 187 organic research projects in German-speaking countries in 1990 investigated animal husbandry issues.

Although ecological advantages of organic agriculture have been studied in the past, most of those studies were carried out more recently. The main exception here is the energy-efficient nature of organic agriculture which has always been considered an important topic. The emphasis was often on energy requirements in the processing of agricultural inputs, such as fertilisers and pesticides. For more details on past research priorities, see Niggli and Lockeretz (1996, pp.13-15), attached as Appendix B.

3.2.2 Priorities in the 1990s

Höök (1997) mentions that there has been a change in focus of research over time. Since the 1980s, attention has moved to defining problems and gaps in knowledge. Present areas of priority are seen as energy; natural resource management; cycles (for example nutrients); plant nutrient availability and management; animal protection and health; agricultural ecology; biodiversity; measurements of food quality; and social and environmental consequences of ecological agriculture. Perhaps it signifies the recognition of the importance of wider issues in the development of organic agriculture.

A conference held in 1990 in Switzerland under the auspices of FAO and the Swiss Federal Research Station for Agricultural Chemistry and Hygiene of Environment (Besson, 1990) showed some of this trend. The general aim of the conference was to review and analyse the status and development perspectives of biological farming in Europe. The recommendations are shown in Box 1.

BOX 1: RECOMMENDATIONS OF FAO/FAC WORKSHOP 1990

- Develop a dialogue between researchers in organic and conventional agriculture. A workshop on one of the topics considered to need research (see below) was seen as a good opportunity to bring together researchers working in the different systems.
- Activities to be undertaken:
 - establishment of a network of those working in extension in organic farming, drawn upon climatic regions;
 - the development of an appropriate educational methodology in training, extension and education;
 - a workshop on nitrogen cycling to discuss current research, appropriate methodology and future areas of interest (held in 1993).
- Topics to be researched:
 - plant protection;
 - appropriate organic livestock systems;
 - stockless farming systems;
 - models for technology transfer between farmers and researchers.

- Development of standards for livestock production in the EU regulations.
- Establishment of a data-base of research results.

Source: Vogtmann, Stopes, Ölez, Besson (1990).

There were three main themes:

- desirability of communications with researchers in conventional agriculture;
- topics of special interest, which were rather wide-ranging, including nutrients, crop protection, livestock (including the development of EU standards) and cropping systems without livestock; and
- development of methodologies, networks and databases.

This last point, in particular, can be seen as a trend towards defining gaps in knowledge.

Another example of the research direction mentioned by Höök (1997) can be seen in Austria. In the early 1990s, Austria accepted organic agriculture as the preferred method of sustainable agriculture and explicitly recognised this form of agriculture as a shift in paradigm (Lindenthal, Vogl and Hess 1996, p.6). In cooperative work between the Research Initiative for Organic Farming and the Ministry of Agriculture, seven areas of priorities were set out, of which 'practical orientation', that is, 'problem solving' research, was only one. The others are listed as follows (Lindenthal, Vogl and Hess 1996, p.6):

- closed materials cycles;
- material efficiency and regional economics;
- energy efficiency and solar orientation;
- strengthening and utilisation of natural self-regulatory mechanisms;
- priorities for suitable systems of livestock-keeping and feeding as well as natural breeding programmes oriented to ethological requirements of livestock and the goal of wide-scoped disease prevention; and
- specific priorities in the fields of organic fruit growing, viticulture and horticulture as well as processing and product quality.

A different methodology (including interdisciplinary activities, long-term initiatives, site orientation, applied research and regional related approaches) in research is considered to be important and is recognised as requiring separate funding. Changes in the processes related to research funding and promotion were also specifically mentioned as being in need of change, such as the process and criteria of evaluation. Many of these issues are mentioned as barriers to research in Section 4.

However, in other countries, the list of priorities of research into organic agriculture shows a different orientation. For example, the UK Register for Organic Food Standards (UKROFS) emphasises technical and production oriented problems, as shown in Table 1.

Short-term production issues, such as weed control, feature rather prominently on the list and pest issues (weeds, insects and diseases) occupy five out of nine places. Research on nutrients show under two headings and the other places are reserved for research in plant propagation and the conversion process, one each. Some interesting observations can be made:

- the lowest priority for funding with money available for organic farming (the conversion process) attracts by far the most funding, at almost half of the number of projects; and
- the list shows topics which are mentioned as appropriate for funding from money available for conventional farming. This notion will be referred to again in Section 5.

Denmark also concentrates its US\$6.2 million for strategic (basic) research and a similar amount for applied research in the areas of farm production: nine in crop management, four in livestock and four in 'farm and surroundings', emphasising interactions between organic agriculture and environment and society (Ellen Hjort Petersen, Royal Veterinary and Agricultural University, personal communications, May 1997). The basic research in crop management concentrates heavily on soil and nutrients (three out of four topics). For the applied research certain sectors are pinpointed for funding, such as some soft fruits, vegetables (including potatoes), cereal and pulses and row crops. In the livestock sector, egg and pig production are singled out.

Table 1: Research topics in organic agriculture in the UK (1995)

		Projects
1.	Agricultural weed control	3
2.	Horticultural weed control	2

3	Plant propagation		1
4.	Perennial weed control		1
5.	Parasites in livestock		1
6.	Nutrient transfer: manure-plants		0
7.	Seedborne and seedling diseases		0
8.	Nutrients from permanent fertilisers: supply and availability	2	
9.	Conversion process:		9
10	to be financed from funding in conventional agriculture		
	a: set-aside and organic rotation:		1
	b: economics of stockless systems		0
	c: economics of organic poultry production		0

Source: Elm Farm (1996).

If inclusion in the Conference Proceedings is representative of the papers presented at the IFOAM Scientific Conference held in 1996, soil issues are also still important in organic agriculture in general. The second part of the Proceedings, which specifically deals with new research in organic agriculture (Kristensen and Hoegh-Jensen, 1996), includes topics as shown in Table 2.

'Plant and soil interaction' is, of course, a rather wide field. However, eight out of the thirteen papers were directly related to nutrient management, which would still place this topic at the top of the list.

Table 2: Number of papers under different topics (IFOAM Proceedings)

Topics	Number of papers
Plant and soil interaction	13
Environmental impact and nature	7
Traditional knowledge in sustainable agriculture	7
Research, education and extension	6
Community, consumer and market	5
Potentials of organic farming	4
Policy and financial strategies	3
Animal production systems	3

Source: from Oestergaard (1996)

3.2.3 Responses to questionnaire

For the purposes of this study people involved with organic agriculture in twenty-four European countries were asked for their opinion on research. Answers were received from thirty-two respondents in eighteen countries. The questions are shown in Appendix C1 and details of the addressees in Appendix C2. No attempt was made to obtain a representative sample, in terms of either institution, research area of interest or country. Implications drawn from the survey should therefore be seen only as indicative rather than conclusive and as adding to other findings.

The lack of understanding between researchers in organic and conventional agriculture, the first point on the FAO-FAC 1990 list of recommendations on which to take action, was frequently mentioned under the barriers and problems to further progress in research in organic agriculture. This will be taken up in the next section.

Priorities mentioned by the respondents to the questionnaire were generally on technical matters, although the respondents from Central and Eastern European countries also mentioned the need for networks as a means of having access to information. Priorities were seen rather like those before the 1990s, that is, soil issues dominated. This was mentioned in relation to other topics such as:

- nutrient supplies to the plant;
- effect on soil conditions on pests; and
- minimisation of negative environmental effects.

Some respondents indicated that they did not think that research in the technical aspects of organic farming was of main importance as those problems were considered to be almost solved. There were two groups of interest, one with emphasis on communication and sharing of knowledge through strengthening of information-links, the other one on research into the socio-economic aspects of organic agriculture:

- individual farmer:
effect of social environment on, for example, rate of conversion;
- institutional level:
 - farmers:
for example marketing structure;
 - researchers:
with increased popularity of organic agriculture, existing research institutions try to integrate organic agriculture into their organizations. For organic agriculture to survive, a strong institutional effort, such as an international network with a peer reviewed scientific journal, was considered important; and
- macro-level: for example, effect on national employment.

Some researchers expressed the need for research in methodologies, for example of advisory work and certification; others of development of the theoretical basis of their discipline.

3.3 Communication

Already at the time of the First ESCORENA Workshop on Biological Farming, the need for sharing information and networking was felt. All respondents to the questionnaire, except for one, considered networks important in the promotion of biological agriculture. What developments have occurred in this area since 1990?

3.3.1 Networks and meetings

The European Network for Scientific Research Coordination in Organic Farming (ENOF) was funded by the Commission of the European Communities of the EU in 1995. At this stage the funding will continue until 1998. ENOF's main objective is to facilitate contact between researchers and to establish collaborations between the European organizations which work in the area of education, research and extension of organic farming. Höök (1997) records twenty-seven members from thirteen countries amongst its members from universities and public or private research centres. Associate membership is possible in principle, for example for centres which carry out investigation in the field of agro-forestry ecology, which would enable participation at ENOF workshops and other scientific meetings which ENOF organises.

ENOF has a Steering Committee, chaired by its Coordinator, who is also the responsible liaison person to the EU. There are five sub-coordinators, one for each area of research:

- crop production and weed control;
- soil fertility and environmental aspects;
- animal husbandry, grasslands and fodder production;
- legal and economic aspects; and
- crop protection.

Annual workshops are organized and the proceedings published. ENOF is also a vehicle for researchers to combine in seeking funding for cooperative projects. In 1996, for example, a project with five social science departments in four different countries was granted funding by the European Commission for a large project which commenced in March 1997. Five universities and scientific institutions in Denmark, Germany, Italy and the United Kingdom are working on a complete inventory of organic farming at the EU-level. The aim is to provide an assessment of the impact of the CAP-reform and of possible policy developments in organic farming in the EU.

IFOAM Conferences

The biennial IFOAM scientific conferences are world conferences. In 1996 (Copenhagen), approximately 1000 people attended; up from about 800 in New Zealand in 1994. German-speaking countries have an annual scientific conference, in German, on organic farming, often with over fifty participants.

3.3.2 Journals and newsletters

There are several journals which specialise in articles on organic agriculture. The more important ones include the 'Journal of Biological Agriculture and Horticulture' in the United Kingdom and the 'American Journal of Alternative Agriculture' in the United States of America. 'Ecology and Farming' is IFOAM's magazine, which aims at keeping readers up to date with developments in organic agriculture all over the world. Research findings are summarised. A German edition is published which focuses more on topics relevant in German-speaking countries. Publications specific for Europe, both not peer-reviewed, include:

a) NENOF

ENOF commenced the publication of a Newsletter, "NENOF", which publishes scientific papers in the field of organic farming.

b) Research Notes on Ecological Agriculture in Nordic Countries

This is published ten times a year. The aim is to speed up the information dissemination on organic agriculture in the Scandinavian countries. It publishes preliminary research results so that the time lapse between research and the dissemination of the results is minimised.

3.3.3 Databases

The Development of a Strategy for Cooperation on Optimal Documentation and Supply of Literature on Ecological Agriculture (DOCEA) has as its aim to increase possibilities for the development of ecological/organic farming by improving access to published research. The philosophy behind the project is to optimise the use of the different databases available in Europe, such as Aberystwyth, Abstreco, Agralin, Gate and Ileia. It was considered that cooperation between the different databases could provide a better service to the needs of researchers and practitioners in organic agriculture.

The first part of the project ran from 1995 to 1997 and resulted in a strategy document agreeing to a procedure for further cooperation between databases on ecological/organic farming.

In early 1997 it was decided to proceed with work on the following:

- providing a database on ecological/organic farming that integrates research reported in the 'scientific' and 'grey' literature, particularly from Europe but also world-wide;
- creating a unified information resource for the whole organic farming community, including researchers, extension officers, farmers, retailers, policy makers;
- integrating records from all participant databases in a central database, preferably on CD-ROM with links to Web sites for updates; and
- establishing a multilingual interface.

The second stage, for which funding is sought from the EU, aims to produce the actual consolidated DOCEA database from the participating databases. If funded, the DOCEA database is expected to be ready by 1999. The result would be a consolidated database available on CD-ROM and also searchable on Internet,

though different options are still open. It is anticipated that the database needs to pay for itself. Cooperation with ENOF occurs, to provide for direct linkages between documentation and research networks on ecological/organic farming.

3.3.4 Education

The European Network for Sustainable Agriculture Education (ENSAE) is proposed by Groenhorst College in The Netherlands to implement a network for extension in organic agriculture. The aims are to:

- disseminate and make widely available for use in formal and informal training, knowledge on sustainable agriculture, amongst others the information from ENOF and DOCEA;
- disseminate and make widely available active learning methods to support the development of professional skills and employment opportunities;
- enhance cooperation and communication between European agricultural education institutes directed at education differentiation and improvement; and
- develop an Internet database on sustainable agriculture and related education practices.

3.4 Priorities and interests according to research institutions

Differences between research priorities depend mainly on the clientele. Applied research is generally carried out by those who have producers as their clients, for example farmers' associations, private research stations, state departments of agriculture and consultants. Basic research can be carried out in places such as universities, where there is relatively little direct contact with farmers and often better equipment and research facilities. Universities also were mentioned as tending to prefer research into Integrated Pest Management (IPM). Many scientists in conventional agriculture consider IPM as a 'more realistic alternative' than exclusively organic farming, while it is more socially acceptable amongst peers.

4. Present barriers and problems

Barriers and problems for the advancement of research in organic agriculture were considered many and varied by the respondents of the questionnaire; lack of funding was mentioned most frequently. However, in any area of research lack of funding is likely to be mentioned as a barrier to greater success. Many researchers added the reasons for insufficient funding and it is these which can be seen as barriers.

Structure of research funding:

Those who allocate funds have generally worked in conventional agriculture and find it difficult to see the relevance of organic agriculture. Reasons for lack of enthusiasm for research in organic agriculture can be explained in several, not necessarily mutually exclusive, ways. For example:

- if organic agriculture is a change in paradigm as described by Kuhn (1970), funding for research in organic agriculture can be expected to be low on the priority list of funding bodies (for a brief explanation on paradigm shifts and why organic agriculture can be viewed as such, see Appendix D);
- Gabriel (1994) mentions sources of funding as an institutional barrier to research in sustainable agriculture and attributes this to greater ease of administration of research requirements in conventional farming. For example, disciplinary research in conventional agriculture is easier to assess than inter- or multi-disciplinary research which is more favoured in sustainable agriculture.

Nature of research in organic agriculture:

- Time requirements:
long-term trials are even more important in organic than in conventional farming, as organic agriculture puts, for example, more emphasis on the effect of crop rotation for soil nutrient and pest management.
- Space requirements:
as organic farming is based on interrelationships of a number of biological processes, relatively expensive whole-farm trials are more important in organic than in conventional farming where multiple small-plot trials are more common.
- Inputs for organic agriculture:

organic agriculture tends to use knowledge-based inputs more intensively than conventional farming, where inputs provided by private industry are more common (such as pesticides and fertilisers). As public research funding in many countries is becoming scarcer and funding by private industry relatively more important, research into organic farming is likely to be proportionately more disadvantaged.

Disunity within the organic sector on project priorities:

For example, farmers are usually more interested in applied research whereas researchers also appreciate the benefits from basic research.

Lack of networking of researchers in organic agriculture with fund providers.

Animal husbandry:

Trials on animals are considerably more expensive than on plants and crops. Where few funds are available, the more expensive areas may not be the first priority.

Other barriers to organic agricultural research were mentioned by respondents as:

Researchers:

Reluctance of researchers to become involved in organic agriculture due to difficulties in recognition within the existing professional infra-structure. Especially respondents from Central and Eastern European countries mentioned a lack of researchers in organic agriculture as a problem.

Lack of supervision for aspiring researchers:

Lack of researchers in organic agriculture in the past means that good supervision of students by a researcher competent in this area is not always easy to obtain.

Lack of peer review:

Difficulties in the past of having articles on organic agriculture published by established journals have resulted in a high percentage of those articles being published in journals which are not always strict with quality control. Increased emphasis on peer review was therefore seen as a way to increase returns from research.

Professional jealousy:

This makes cooperation in complicated projects a problem.

Lack of legislation:

Central and Eastern European respondents mentioned the lack of legislation as a problem for progress in organic agriculture and consequently for research in organic farming.

Outside pressure:

Pressure by foreign private companies, about the need for fertilisers and pesticides in farm production, was mentioned as a possible problem in the development of organic agriculture in Central and Eastern Europe.

Gabriel (1994), reporting on a workshop on barriers to research in sustainable agriculture in the USA, also mentioned the structure of the research funding; the time requirement; the lack of unifying vision; the reward mechanism for researchers; and the lack of peer review. He added to this list, farm policies in the USA. An example was the commodity support programmes which discouraged crop rotations, thus increasing the need for pesticides. Another example was legal product quality requirements, which might make it difficult to sell if organic methods are less effective than conventional methods. Such policies influence the

demand for particular research in the two examples given above, not for sustainable agriculture but for pesticide-intensive technologies.

The policy with the most direct effect on research in a particular area is funding. Lampkin and Weinschenck (1996) reported on funding for research into organic agriculture in the EU under Framework III and IV, though no mention is made of the amount. Individual countries also provide money. Denmark has set aside over US\$15 million for research from 1996 to 1999, with likely additional amounts being allocated during that period (E. Hjort Petersen, Royal Veterinary and Agricultural University, Copenhagen, personal communications, April 1997). Norway spent approximately one third of its total allocation of almost US\$15 million on research between 1989 and 1994 and Sweden spent almost US\$18 million on research between 1986 and 1996 (Höök 1997). The Netherlands, although not specifying its research budget, has allocated over US\$30 million to organic agriculture between 1997 and 2000 (K. Zimmerman, Dutch Agricultural Economics Institute, The Hague, personal communications, May 1997).

Other subsidies affect research less directly, such as those for conversion to or establishment of organic farmers (see Lampkin and Weinschenck (1996) for details). The same authors also mention changes in CAP policies in 1992, which changed the profitability of organic farming and the cost of conversion. In general, established organic crop farmers could well have benefited from the decoupling of subsidies and yield, although livestock farmers received low quotas as compared to what they could have received under a conventional system. These lower quotas could result in lower land values, which is especially important when selling the farm. The situation was somewhat different for farmers in conversion, for whom changing the relative importance of their enterprises (more or less crop or livestock) would be more costly than previously. For example, moving towards a system which requires less cropping and more livestock could mean a loss of eligibility of some arable area payment, while having to purchase a quota for livestock. Some countries, including Austria, Britain, Denmark, Germany and Sweden, made special provisions to ameliorate at least some of the costs to those farmers.

No respondents mentioned activities of interest groups, for those who stand to gain or lose if research in organic agriculture were to be increased, although they no doubt would have some effect.

To summarise, the most important barriers and problems for the advancement for research in organic agriculture were considered by respondents to the questionnaire (all Europeans) and by participants of a workshop in the USA not to be technical, but institutional. The main barriers mentioned were the present structure of research funding; the different requirements in organic agriculture leading to rather expensive research; lack of a united front by the organic sector; scarcity of networks by researchers in organic agriculture; relative lack of good researchers and absence of structure to foster them (by good supervision of potential researchers and peer review); and policies which encourage research in organic agriculture directly or indirectly. In Central and Eastern Europe, lack of legislation and outside pressure regarding the need for certain inputs were also considered problems.

5. Analysis of present and future research needs

Decisions made on priorities for funding of research will depend on who makes the decision and what pressures the different groups of beneficiaries can bring to bear on the decision-makers. No attempt is made in this section to reach a conclusion on the most efficient way to spend research money. Rather, we look at the participants and discuss what are the most likely areas of interest for research in organic agriculture in the short and medium term.

5.1 Who benefits?

At first sight, farmers appear to be the beneficiaries of agricultural research, which aims at decreasing costs for the same output (or increasing output for the same costs). In an environment where output prices are not guaranteed, as is the case with organic produce in the EU, prices are related to total supply and demand. If the quantities of output increase and consumption stays the same, prices are bound to drop. A similar situation (where supply increased due to Eastern European countries entering the organic grain market in the EU, which resulted in decreasing prices) was described by Hamm and Michelsen (1996). Although the first farmer to use a new technology could gain substantially from research results (lower production costs per unit, without noticeable increases in total supply and therefore drop in price), long-run

gains are likely to be far less. In other words, it is mainly the consumers who stand to gain from technology improvements in agriculture. Other gains can be made in the form of environmental benefits.

5.2 Measuring research impact

One way of measuring the improvements through research is to measure increases in yield over time. However, yield is also related to a number of other factors, such as management skills and inputs used. As mentioned in Section 2.4, Lampkin and Padel (1994, p.202) concluded that yields on organic farms have increased over time, although at a slower rate than those on conventional farms. These figures do not take into account changes in input cost. It is conceivable that yield increases on organic farms have taken place due to improvements in information-based technology, such as knowledge about the place of a particular crop in the rotation, or row distance. Such an improvement requires less direct expenditure than, for example, a more intense use of fertilisers and pesticides, which is more associated with increased yields on conventional farms. If there were such a difference in expenditure on inputs between the systems, the real difference in yield would be less than what appears to be the case at first sight.

5.3 Farm productivity

Results of both technical (production oriented) and socio-economic research (such as how changes in output can affect prices and optimal combinations of rotations, etc.) can improve farm productivity. Direct benefits are derived mainly from applied research, hence the emphasis on short-term production-related research in the early years of the development of organic agriculture, when organic farmers were the main funders of research.

In the past, this research has often been directed to crop management, with an emphasis on soil, nutrients and weeds. In those countries where organic agriculture is not well established, such as some Central and Eastern European countries, this emphasis could continue for a while. In Western European countries, some redress of the imbalance in topics is noticeable with increased attention to livestock. This is likely to continue in the future. However, it is difficult to imagine that it would relegate research in crop production to second place, especially in countries where crop production is important. In some countries, such as in the UK, farming systems without livestock have had some attention in the past and are likely to continue to be of interest in the future, possibly making them of particular relevance to some areas in developing countries. Livestock issues not only include practical livestock production issues (such as diseases and parasites), but also philosophical ones like determining the place of livestock in the farming system (Lund 1995).

Basic research can be seen as a means to understand processes and through this understanding, increase the potential of progress. It is, perhaps, a more long-term proposition which can be seen as an investment, sometimes rather risky. However, in organic agriculture, some consider it not much more than a means to ‘...enhance the researchers’ reputations among their peers’ (Niggli and Lockeretz, 1996, p.18) and not to great advantage of farmers. Although, undoubtedly, research has been and will be carried out for other reasons than for the advance of farmers or the community, neglecting basic research cannot be but to the detriment of progress in organic agriculture. This view is being voiced more clearly recently (see for, example, Niggli and Lockeretz (1996)), and more emphasis on this kind of research is therefore likely in the future, such as in resistance physiology, weed biology and soil biology (Raupp, 1994).

5.4 Comparisons

In the early years, financial comparisons between organic and conventional farming were high on the list of research priorities, especially in terms of financial performance.

This was the case even though established organic farmers did not need to know that the financial comparison between themselves and conventional farmers was at an acceptable level, as found through their own experience. One can surmise that social factors played a role, for example, the need of organic producers to prove that their farming methods were functional and productive. In addition, for researchers to be convinced that this was an area worth exploring in the future, some comparative studies were unavoidable. However, at this point in time financial comparisons do not hold a great attraction for this group of farmers.

Comparisons of physical/biological variables could be viewed differently. As they can give an insight to the weak and strong points of the organic system, they can therefore indicate the areas of most

urgent need of attention for research, or possibly in which direction solutions are most likely to be found. For example, comparisons made it clear that plant and animal health on organic farms is often better than on conventional farms. Research into the mechanisms could lead to making full use of this characteristic in both organic and conventional agricultural systems.

The situation for potential organic farmers is different. Although past financial comparisons will be of interest, changes in input prices, output prices, knowledge about management, environmental regulations, etc. change the relative profitability between systems. For this group of farmers, comparisons under present conditions of farming are of interest. However, the question is whether resources allocated to organic farming need to be used for this purpose. In the UK, for example, the priority list for projects to be funded in organic agriculture contains three topics which are mentioned for funding by non-organic funds. Two of them are economic analyses, which presumably will show how the particular enterprises in question, stockless farms and poultry, compare with conditions on 'normal' farms. The decision to recommend these topics for funding by non-organic agriculture resources could well have stemmed from considerations of the beneficiaries of the study.

Returns to farming are not only dependent on the production process but also on the existing infrastructure (such as research funding institutions; marketing arrangements (licensing; legal recognition of the word 'organic'; marketing boards); education and extension services; input pricing arrangements). Hence, research convincing policy makers that organic farming does not ruin the farming community or the country, would indirectly benefit organic agriculture. Originally, comparisons were needed to obtain initial interest. Furthermore, comparisons are useful to collect knowledge on the magnitude of, for example, the effect of a change of policy on the different systems. It is policy changes, such as a redirection of research funding and appropriate pricing of environment-polluting inputs which can ultimately benefit those in organic farming. Alternatively, some comparisons can assist in estimating the effects of, for example, changes in output prices and trade policies on the different farming systems.

Whether these kind of benefits warrant eighty per cent of the funding of research in organic farming, as reported by Lindenthal and Plakolm (1993) in Austria in 1991, is of course questionable (Niggli and Lockeretz, 1996). That Austria has now explicitly decided that system comparisons are no longer a priority in research is not surprising in a country which has accepted organic agriculture as the form of sustainable agriculture (Lindenthal, Vogl and Hess, 1996). It is to be expected that the importance of financial comparisons between the two systems in other countries will decrease with increasing official acceptance of organic agriculture. Austria has stipulated though, that in case the '...evaluation of new methods cannot otherwise achieve sufficient impact' (Lindenthal, Vogl and Hess, 1996, p.6), it will still use comparisons as a tool of analysis. In other words, although funding of these types of projects is to be minimised, it is still likely to occur to some degree. Similar developments can be expected in other countries. However, researchers in countries which are relatively recently entering the era of organic agriculture, such as in Central and Eastern Europe, showed most interest in comparisons, not only in the different management systems within their own country, but also in what was available on this topic in other countries.

5.5 Conversion

It has generally been recognised that the conversion time can be difficult for farmers for a number of reasons, including the need to develop the necessary management skills; biological systems on the farm needing time to adjust; investment requirements; and (lack of) marketing possibilities. In order to facilitate the transition from conventional to organic agriculture, considerable research has been carried out in the past. At least in some countries, this research looks as if it will continue for some time to come (see, for example, Elm Farm (1996, p.15-16) for the situation in the UK).

5.6 Consumers

It is only if consumers are willing to buy the produce, that farmers can recoup their production costs. The willingness of consumers to pay a higher price for organic than for conventionally grown produce is not only dependent on what they perceive as the quality of the end-product, but also on their interest in the effect of the production process on the environment. Therefore, information on the food quality and environmental effects of the two farming systems is of interest to consumers. Work has been done in the past, where 'life-cycle assessment' has combined quality for health aspects and environmental effects (Meier-Ploeger and Vogtman, 1996; Mattson, 1996). Continued interest in these variables is likely in the future.

Apart from information on the product itself, more emphasis is being put on marketing aspects of organic products. At present there is a dearth of information of all kinds of variables in this area, ranging from expected demand and supply to effects of those changes on prices and thereby on returns to organic farming. Hamm and Michelsen (1996), in their analyses of developments in the German and Danish market in the early 1990s, are rather convincing in their argument that neglecting this area in favour of production issues could have been detrimental to organic farmers. Indeed, for most food products, only a small proportion of consumer expenditure finds its way back to the producer. It is therefore difficult to sustain an argument that higher production costs on organic farms are the key issue. Research on improvement of the marketing system, resulting in lower marketing costs and lower prices, thereby facilitating an increase in consumption of organic produce, are also called for. The effect of promotion on consumer demand is another area of interest.

5.7 Society

Organic agriculture is recognised as a way of farming which can alleviate problems inherent to conventional farming. For this reason it is of importance to study how different policies encourage or discourage conventional farmers to make the change to organic management and which policies would bring the desired effect closer. Alternatively, studying the effects of changes in (proposed) policies on organic farmers would enable policy-makers to take such effects into account when making decisions. In the past such studies might have been carried out to enable the environmental interest groups to provide policy-makers with evidence. However, there are now signs that policy-makers seek out this information. For example, a study to research the effect of policies on organic farming and the contribution of organic agriculture to current agricultural and environmental policy objectives, has recently been commissioned by the EU as reported in Section 3.3.1. This study runs from 1997 to mid-2000.

5.8 Environment

Benefits of organic agricultural management to the environment is an important reason for the interest in organic agriculture in Europe. Research on the effect of this farming system on issues such as biodiversity, water quality, erosion, etc. is therefore likely to continue in the future.

5.9 Data and standards for data

Data on organic agriculture in the public domain is almost non-existent. Many countries have Bureaux of Statistics, Agriculture, and Agricultural Economics which collect data on a number of variables, ready for use when needed. Although some government departments do collect data specifically related to organic agriculture (such as the Institute of Agricultural Economics in The Netherlands), the amount of data on this sector is limited. Most of the data available in this area are probably held by individual researchers.

Standardisation of methods and experiments has not occurred to any large degree in organic agriculture to date. Yet, as standardised trials allow comparisons, standardisation is of great importance as it can reduce the need for research, for example.

6. Recommendations

In the context of food security, the UN Commission of Economic Development's (UNCED) follow-up and other global agriculture programmes, FAO has the large responsibility to provide access to and information on ALL agricultural methods which can fulfil in part or in whole its mandate and the special programmes. Therefore, organic agriculture, being a proven production method with many benefits which cannot or are difficult to provide with conventional agricultural methods, should be given serious and much wider attention. FAO needs to give support to organic agriculture in general and the improvement of and education in organic agriculture in particular. Some specific recommendations for such support in the European Region are given below.

6.1 Networks

One of the characteristics of organic agricultural research is that it is rather site-specific. Differences in physical and biological conditions (such as soil types, climate, etc.) between locations, play a considerably larger role in organic than conventional agriculture. Despite this, all but one of the researchers mentioned the benefits of increased contacts through such mechanisms as networks with others in their field.

As organic agriculture encompasses the whole spectrum of activities and enterprises in agriculture, a network for the whole of organic agriculture would be too vast to be useful. The need for a focused network, that is, a specific topic for the network, was stressed by many of the respondents to the questionnaire. A number of areas which could be logical topics for research include:

- soil management;
- modern breeding methods without genetic engineering;
- fruit management, selecting a particular aspect such as disease management or a special species;
- animal husbandry and alternative animal treatment;
- marketing institutions and effects;
- food quality;
- food processing methods;
- environmental effects of organic agriculture, such as biodiversity conservation, landscape management;
- renewable resource management; and
- policy options.

All of these topics and many more, are worthy of FAO's attention. When choosing a topic, the criteria for the choice should therefore be considered. If the network is to have extensive contact with an important FAO programme, soil management could be a good choice as soil is a major topic in organic agriculture as well as in FAO. However, if the criterion is to give support to an area which has been relatively neglected but is no less deserving, livestock management or horticulture (especially fruit) could be the more logical choice. Some topics such as marketing and effects of policies on the development of organic agriculture, though neglected in the past, have recently started to gain attention (see Section 5.7). These recent initiatives in Europe, render a new FAO network in the latter subjects, perhaps less justifiable.

Sponsorship by FAO of networks in any of the above areas, within ESCORENA or otherwise, will facilitate organization and other financial assistance of these working groups. This catalytic effect is of significant importance and permits increased participation of Central and Eastern European and Mediterranean scientists. The network support could be extended not only to research groups but to groups for which exchange of ideas in organic agriculture is rather important, such as for:

- extension services: exchange on conversion methods; and
- inspection services: exchange on inspection and certification problems.

6.2 Databases

- The establishment of comparable databases, not only bibliographic (DOCEA), would be of great benefit to the research community as well as to extension services and producers. Standardising data collection and conversion could be a start for some working groups. The necessary financing for the final databases could be a collaborative project, elaborated as a result of these first efforts. Almost all contacted researchers expressed an interest in and need for the availability of such data.
- FAO could greatly enhance visibility and improve attention to organic agriculture by including it in its annual production and trade statistics, that is, by requesting that information from governments.
- An expert list with specific focus on FAO collaboration in developing countries may be of great benefit.

6.3 Technical consultancies

- Occasional technical consultancies on selected topics may well serve to focus research further and promote it in regions outside of Europe. These may be of more importance to progress in non-European Regions or Central and Eastern Europe. Expertise on a variety of tropical and subtropical conditions is available in Europe.
- According to the Codex Alimentarius draft guidelines, there is a need for the defining of organic production, which would assist countries in their understanding of an applied organic production system. The aim is to achieve international harmonisation of these systems in order to facilitate international trade and to support food security initiatives. Technical consultancies

in the areas of, for example, processing, animal standards and new input evaluation could be useful.

- Jointly organized meetings or FAO sponsorship with regional, national or international research institutions or NGOs in part or as a whole focusing on organic farming practices, would be enriching for all partners.

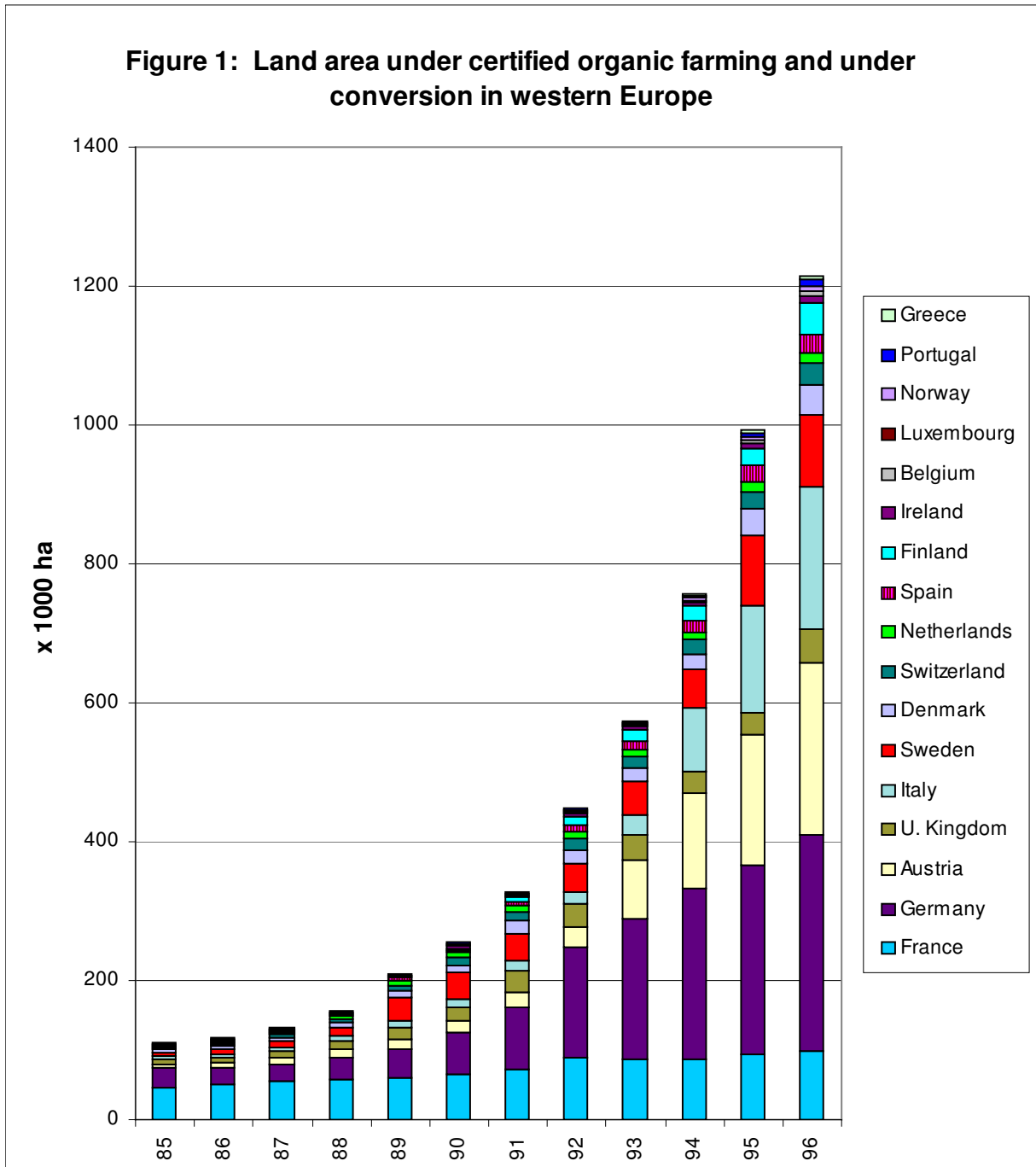
6.4 Publications and studies

- The support of special studies and publications of proceedings of workshops, etc., is a very important tool and should be used within the framework of networks, databases and meetings. FAO's reputation and global exposure will be of considerable benefit for the distribution of information of any organic agriculture related activities. Electronic publication and FAO's World Agriculture Information Centre (WAICENT) should be made fully available to publicise activities in organic agriculture.
- Closer ties between FAO and IFOAM could facilitate the availability of relevant information on organic agriculture and should therefore be encouraged.
- Results from the EU project described in Section 5.7, would be excellent and opportune for FAO to publicise.
- A special topic electronic discussion list may be of further use either in the framework of a new network or under one of the existing networks.

6.5 Other

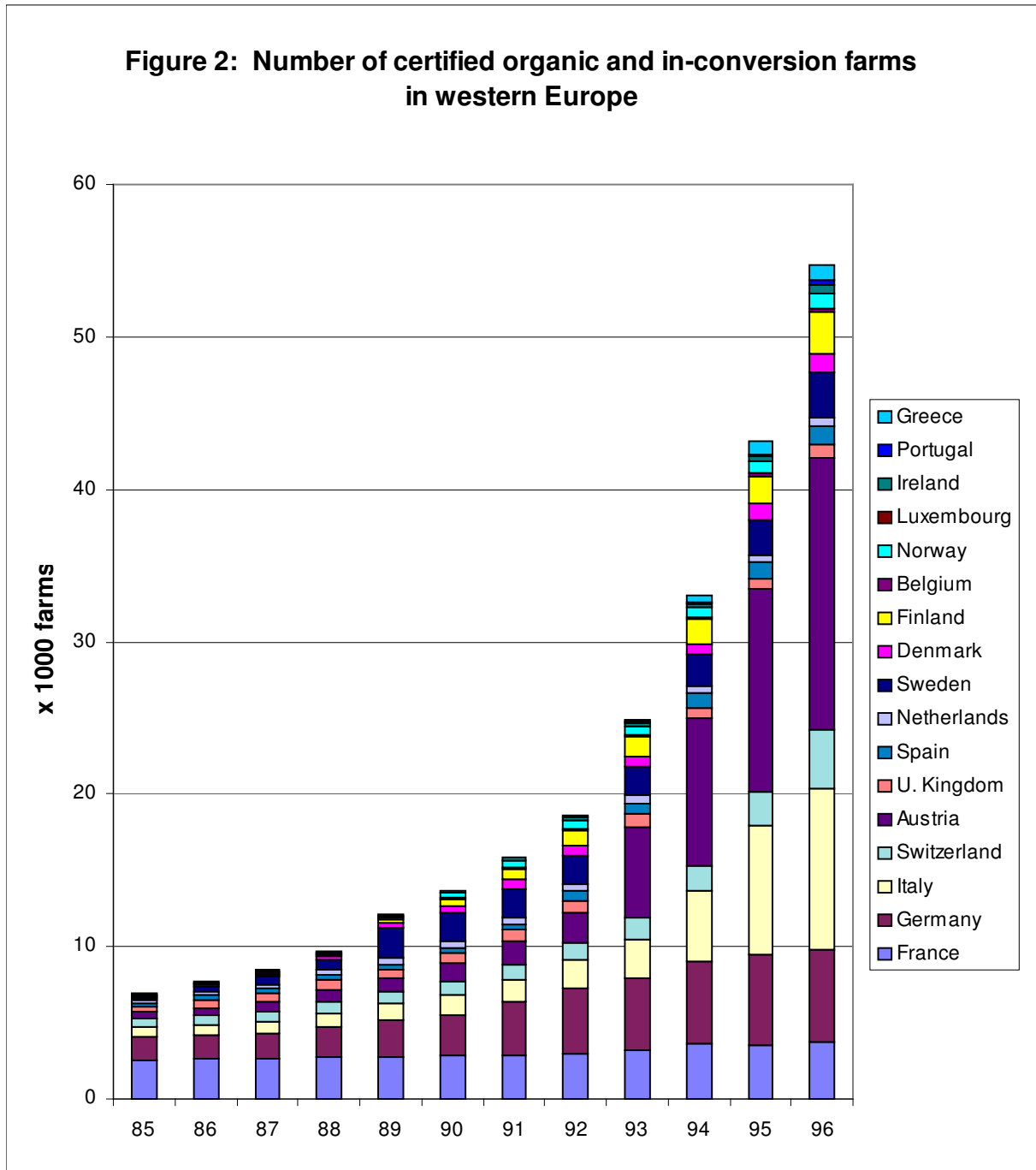
- FAO could give broader support to the sustainable and environmental benefits of organic agriculture through special studies and through dedicating time and space to it in all policy, research and implementation related activities, reviews and evaluations.
- It is strongly recommended that not only elements of organic agriculture are included in current and future activities (Contado, 1996), but that organic farming as a complete system is given due consideration in such programmes as the Integrated Plant Nutrition System, animal and plant health programmes, the Agroecology interactive guide, the conceived Sustainable Agricultural Technology Transfer and Information Centre (SATTIC) and other activities.

Figure 1: Land area under certified organic farming and under conversion in western Europe



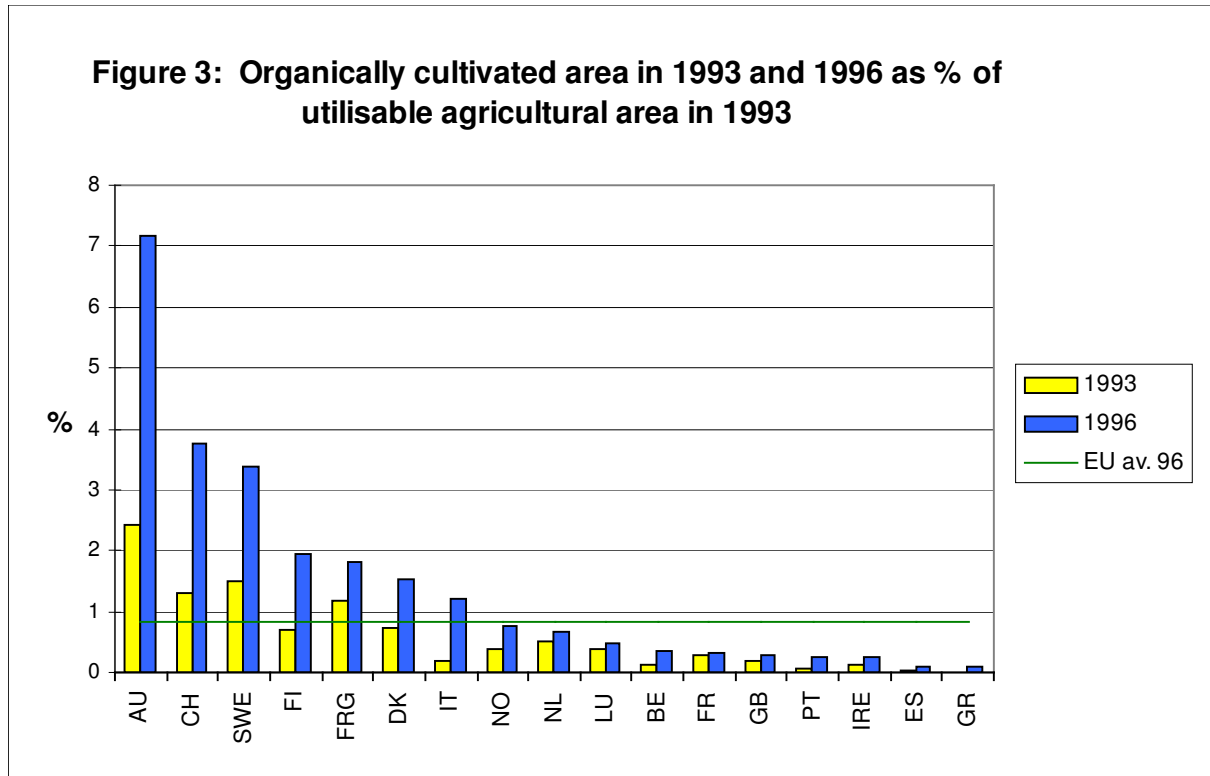
Source: N. Lampkin, Welsh Institute of Rural Studies, Univ. of Wales, Aberystwyth, UK

Figure 2: Number of certified organic and in-conversion farms in western Europe



Source: N. Lampkin, Welsh Institute of Rural Studies, Univ. of Wales, Aberystwyth, UK

Figure 3: Organically cultivated area in 1993 and 1996 as % of utilisable agricultural area in 1993



Source: N. Lampkin, Welsh Institute of Rural Studies, Univ. of Wales, Aberystwyth, UK

APPENDIX A: TERMS OF REFERENCE

The objective of the Report, entitled: "Research on Biological Farming Methods in Europe, Status, Requirements and Perspectives", is to provide a working document with sufficient information and recommendations to permit FAO and research experts to evaluate the need and possible focus of an ESCORENA research network on Biological Farming Methods or other support which can be provided by FAO and be of benefit to FAO.

The Report should cover at least the following topics:

- Review of past and present research activities, priorities and trends;
- Review of relevance of biological farming methods for agriculture, environment, economy and society in Europe and its global significance;
- Importance, relevance and special issues for research in support of improvement of biological farming practices (priorities and interests according to government research institutions, universities, private organizations, international institutions and farmers);
- Present barriers and problems for the advancement of research in biological farming;
- Analysis of present and future needs of researchers in Western and Eastern Europe related to research in biological farming (priorities, collaboration, joint projects, cross-country comparisons, data needs, policy, etc.); and
- Recommendations including suggestions on activities which could lead to future action by FAO: technical consultations, networks, NGO collaboration, publications, databases, information exchange and others.

A detailed content list and content development should be established in close cooperation with REU technical officers. A draft should be provided to REU for comments at least two weeks prior to the final deadline.

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APPENDIX B: PAST RESEARCH

What has been achieved until 1996?	References
<p>Arable Crops</p> <ul style="list-style-type: none"> • High capacity implements for mechanical and thermal weed control. • Optimised tillage, mulching and soil conservation technique • Better crop rotations and tillage to preserve nutrients (esp. nitrogen) and to compete with weeds. • Optimised techniques for storage, preparation and distribution of farm yard manure and slurry. • New implements and preparations to improve composting; introduction of household waste compost. • Enhancement of disease suppressivity of soils and resistance induction by micro-organisms. • Introduction of variety mixtures in wheat (better milstem resistance). • New biological seed dressing methods and seed quality. • Progress in wheat breeding for disease resistance and protein quality under low-input conditions. • Greatly improved knowledge about the enhancement of beneficial organisms in crops with field margins, hedgerows and weed strips. <p>Horticultural Crops (vegetables, fruits, vine)</p> <ul style="list-style-type: none"> • A much greater range of disease and pest resistant varieties, esp. apples and various vegetables. • Several dozen new organisms for pest control in glasshouses and in the field. 	<p>Dierauer and Stöppler, 1994</p> <p>HAMPL. 1995</p> <p>Woodward and Burge 1982; Heß, 1990; Köpke, 1992; Philipps and Stopes, 1995</p> <p>Dewes, 1987; Ott., 1990;</p> <p>Pierr, 1992, Stein-Bachinger, 1993;</p> <p>Berner <i>et al.</i>, 1995</p> <p>Fricke <i>et al.</i>, 1990; Amlinger, 1993;</p> <p>Berner <i>et al.</i>, 1995b</p> <p>Schüler <i>et al.</i>, 1989; Weltzien, 1989</p> <p>Wolfe, 1985</p> <p>Pierr, 1990; Winter <i>et al.</i>, 1994</p> <p>Stöppler <i>et al.</i>, 1993;</p> <p>Kunz and Karutz, 1991</p> <p>Nadwo, 1982; Altieri and Letourneau, 1994; Nentwig, 1988, 1989;</p> <p>Thomas <i>et al.</i>, 1992</p> <p>Weibel, 1995</p> <p>Ramakers, 1989;</p> <p>Pfiffner, 1994;</p> <p>Bathon, 1995</p>
<ul style="list-style-type: none"> • First microbial antagonists for disease control in practice. • New plant extracts and mineral compounds for pest and disease control (neem, rape oil, fennel oil, clay-powder, etc.). • New mechanical pest control techniques (nettings, pheromone traps, etc.). • Reduction of the application rate of copper in fruit, vine and vegetable growing due to new degradable compounds and better application techniques. • New specialised implements for weed control and mulching in all crops. • Better soil conservation and mulching techniques to compete with weeds and to control water and nitrogen supply. • Greatly improved knowledge about the enhancement of beneficial organisms and antagonists (“system design instead of pest and disease control”). 	<p>Schmutter and Asher, 1987;</p> <p>Häseli, 1995</p> <p>Dierauer and Stöppler, 1993;</p> <p>Weibel, 1995</p> <p>Altieri <i>et al.</i>, 1985; Bugg <i>et al.</i>, 1994; Wyss, 1995</p>
<p>Animal Husbandry</p> <ul style="list-style-type: none"> • Solutions for species-appropriate housing and outdoor 	<p>Van Putten, 1978; Stolba, 1981;</p>

<p>What has been achieved until 1996? fattening/breeding.</p> <ul style="list-style-type: none"> • Basic data for appropriate breeding programs and breeding for longevity. • Application of homeopathy, plant therapies and biological control of livestock pests in veterinary medicine. • Holistic strategies of health prevention (herd management, etc.) <p>Farm Management</p> <ul style="list-style-type: none"> • Large data banks in all countries about the economic efficiency of organic farms. • Advisory services provided with better data for farm planning and conversion (gross margin catalogues, PC planning programs). 	<p>References Etter-Kielsaas, 1986; Rist et al., 1987; Fölsch and Vestergaard, 1984; Schmid, 1991 Bakels, 1960; Haiger, 1988;</p> <p>Scofield, 1984; Stopes and Woodward, 1990; Patterson (ed.), 1990 Howard <i>et al.</i> 1989; Rüschi, 1994</p> <p>Lampkin and Padel (eds.), 1994; Freyer et al. (eds.), 1995</p>
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<p>Quality and Human Nutrition</p> <ul style="list-style-type: none"> • A large database of comparative studies of the quality of organic foodstuffs. • New methods of quality testing (picture developing methods, biophotons, etc.). • Research on sensory qualities. • New definitions of quality (related to ecological and sociological attributes). • Modern concepts of quality management in certification. <p>Ecological Balance, Regional Conversion</p> <ul style="list-style-type: none"> • Many studies concerning the ecological advantages of organic farming. • Studies on regional development, nature conservation and organic farming. • Studies on energy consumption in organic farming. • Studies on climate and global environmental change and organic farming. 	<p>Woese <i>et al.</i>, 1995</p> <p>Balzer, 1994; Mäder et al., 1993</p> <p>Basker, 1992</p> <p>Reganold <i>et al.</i>, 1987; Wolff-Straub, 1989; Beck, 1991; Bauchhenss, 1991; Mäder <i>et al.</i>, 1993; Pfiffner and Niggli, 1996 Braun, 1995; Freyer and Reisner, 1996; Bechmann <i>et al.</i>, 1996. Lockeretz, 1977; Klepper et al., 1977; Alföldi <i>et al.</i>, 1995 Meier-Ploeger and Kjer, 1995; Haas and Köpke, 1995</p>
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Source: Niggli and Lockeretz (1996)

APPENDIX C: QUESTIONNAIRE

C.1 Questionnaire

You may have seen in the IFOAM Newsletter of October 1996 the message about the FAO and FAL Joint Conference (Federal Agricultural Research Centre) in Braunschweig, Germany from 22 to 28 June 1997. Part of that Conference will be on organic agriculture and is sponsored by FAO. FAO is interested to see whether setting up a network is of interest to researchers in organic agriculture and if so, in which way FAO can contribute. In order to initiate the debate. I have been asked to write a report on organic research in Europe, including about where research could/should go in the future.

I feel it is only appropriate to ask those who are involved with organic agriculture how they see research in this area in the future and in which way they think FAO can be of help to them. For this reason I am interested in your opinions on the following issues:

1. Research in support of improvement of biological farming practices:
What are the interests and priorities at present?
Is there a difference between research institutions, universities, other private organizations and farmers?
2. Present barriers and problems for the advancement of research in biological farming.
3. Present and future needs of researchers related to research in biological farming:
What are your priorities?
Do you want collaboration with others, and if so, how?
(For example, joint projects, cross-country comparisons, data collection, policy development).
4. How do you think FAO could work with researchers in biological farming: technical consultations, networks, NGO collaboration, publications, databases, information exchange, other?
5. What does a network need to be or what do you require from a network to be interested in joining?
6. How could/would you or your organization contribute to and make use of a network for researchers in organic agriculture?

C.2 Addressees

The questionnaire was sent to three groups of people:

1. An email mailing list on ecological agriculture (many people with an email address in the IFOAM Conference (Copenhagen, August 1996) List of Participants were personally addressed by email). A selection was made as follows:
 - in countries with few email addresses, all people were addressed;
 - in countries where many people had email, a selection was made of people expected to be particularly relevant in the area of research, such as one person from each research station, department or other organization.
2. In those countries from which too few email contacts were received, people were addressed by fax or letter.
3. Directors of the Avalon Foundation who live in Central or Eastern Europe.

APPENDIX D: PARADIGMS

Kuhn (1970, p.10) explains a paradigm as:

'normal science' which is '...research firmly based upon one or more past scientific achievements, achievements that some particular scientific community acknowledges for a time as supplying the foundations for its further practice'. Scientists conduct research within the existing paradigm. This is the 'world view' in which they define and test hypothesis and interpret data. A paradigm and its rules, as revealed in textbooks, lectures and laboratory exercises, limit the nature of acceptable solutions and the steps by which they are to be obtained.

In theory, discussions between the proponents of the different paradigms are never quite satisfactory for a number of reasons. Kuhn calls those collectively 'incommensurability', of which the most essential part is that '...proponents of competing paradigms practice their trades in different worlds' (Kuhn 1970, p.150). A quote can make the issue clearer:

'...Both are looking at the world and what they look at has not changed. But in some areas they see different things and they see them in different relation one to the other. That is why a law that cannot even be demonstrated to one group of scientists may occasionally seem intuitively obvious to another. Equally, it is why, before they can hope to communicate fully, one group or the other must experience the conversion that we have been calling a paradigm shift. Just because it is a transition between incommensurable, the transition between competing paradigms cannot be made a step at a time, forced by logic and neutral experience. Like the gestalt switch, it must occur all at once (though not necessarily in an instant) or not at all'.

A typical process of a paradigm shift goes as follows: 'normal science' is starting to be troubled by crises. Such crises are due to phenomena which cannot be explained by the theory on which the science of the day is based. 'Normal science' is constructed in such a way that a new paradigm (that is, a new 'science' with its own theories, rules and assumptions) is resisted by most scientists. That is, anomalies are considered as another piece of the 'puzzle' which has not yet been solved but will in time, within the existing paradigm. Anomalies are never seen as disproving the universal application of existing theories. In order to cope with them, '*ad hoc*' modifications are made to 'normal science'.

In the meanwhile, a different theory is developed which, in the beginning, can only explain some of the questions posed. Some scientists take the step towards the new theory, which means an adjustment to the principles which are the basis of their research. Different questions are asked, solutions are sought in different ways from previously. Specialised journals and societies appear. Claims are made for a special place in the curriculum of education institutions. A discussion between the two competing paradigms is never quite satisfactory, as theories are incommensurable (having no common standard of comparison) and proponents of each camp base their arguments on different assumptions and priorities. Over time textbooks are written, the new ideas are popularised, more scientists take the step and slowly the new paradigm becomes 'normal science', displacing the old paradigm.
(From: Wynen, 1996, pp.4-5 and 29).

Wynen (1996) found that the process of development of organic agriculture was rather similar to Kuhn's outline of a paradigm shift in science. As proponents of one paradigm are not likely to consider another paradigm useful for progress, this will reflect in fund allocations.

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ORGANIC FARMING AND RESEARCH IN THE NORDIC COUNTRIES AND COMMENTS ON THE REPORT OF ELS WYNEN

by Vonne Lund

Organic farming is of growing importance in all the Nordic countries, based on the consumers' demand for organic products. Organic farming is called "ecological agriculture" in the Nordic countries.

In Denmark, Finland, Norway and Sweden much work has been performed on different levels during the last five to ten years, to develop organic farming systems based on local resources and optimal use of the biological production potential. However, within research the approach has been somewhat different in the different countries. For example, in Denmark there has been emphasis on modelling of complex agro-ecological systems, whereas in Norway much work has been done on farm systems studies and on-farm research, the development of farm-research in cooperation between scientists, farmers and advisory officers.

During the last four to five years, there has been growing cooperation between the Nordic countries regarding research, education and extension related to organic farming. In several of these areas, firm collaboration is now established.

Nordic network experiences

One example of Nordic networking activities is the three subsections formed within the Nordic Association of Agricultural Scientists to deal with ecological agriculture; one for animal husbandry, one for extension issues and one for ecological agriculture in general. As a result, seminars are being arranged in these different fields.

Another example is the "Nordic research network, ecological agriculture", which started in 1996 through the sponsoring of the Nordic academy for advanced study under the Nordic Council of Ministers. The following areas are included in the network:

1. *A Nordic research and development programme.* This aims to develop research, focusing on multidisciplinary research for the development of the ecological (organic) farming system.
2. *A Nordic postgraduate education programme.* Three Nordic Ph.D. courses in ecological agriculture have been arranged so far.
3. *Coordination of education (B.Sc., M.Sc.) and research information (Nordic newsletter).*

The aim for the future is to organise this network through NOVA, the Nordic Agricultural University, which is just commencing. A working group has recently presented a suggestion for a Nordic M.Sc. in Agroecology/Ecological Agriculture to be run within the framework of NOVA. According to the suggestion, each country will have its own M.Sc. profile, but parts of it will consist of joint Nordic courses. Efforts are also made to coordinate this education with the education programme planned on a European level.

The goal is to also include the Baltic states and north-west Russia in the Nordic network. One step in this direction has been taken through the publishing of an Estonian newsletter on organic farming, starting in 1996, with the help of the editor of the Nordic newsletter. Funding has been applied for regarding a similar project in Lithuania.

Nordic newsletter

Since 1995, a Nordic newsletter "Research Notes on Ecological Agriculture in Nordic Countries" has been published through the cooperation of ten Nordic universities and research institutions. The aim is to quickly spread research results related to organic farming. (See also Els Wynen's report.) These first two years of publishing have been a trial period and an evaluation is about to take place this Autumn. One of the things to be discussed is if the newsletter should be published in English in the future, instead of in the Scandinavian languages as now, thus making it available to a wider public.

Increase in research related to organic farming

Today, in all four countries, resources are allocated to fund research in organic farming. Some information on the amount of funding in the Nordic countries is given in Els Wynen's report, but a more complete picture is given in Table 1 below.

Future areas of networking

In creating networks for research related to organic agriculture, it is important to focus on the different approaches of organic and conventional agriculture. For "organic" research, the great challenge lies in the emphasis of systems thinking and in using a holistic approach to the problem solution. What is really new with organic farming (and which might qualify it as a new paradigm) is the idea that the whole cannot be deduced only from studying the parts. This is contrary to the fact that most of the "organic" research so far has been performed in quite conventional areas, e.g. soil science and plant nutrition, as shown in Wynen's report. The reason might be that it has been much easier (if at all possible) to find support for this type of research within the existing structures.

Thus systems thinking must be emphasised much more in future research. Also research of a traditional, "reductionistic" kind (which of course is also needed) must be put in a larger frame. As I see it, the most urgent need for networking is within the field of holistic approach.

However, it is important that the chairman and secretary of the group should be organic researchers, well oriented in the principles of organic farming.

Future network activities

The most simple kind of network would be to create a list of researchers and “resource persons” in different areas. Even though simple, such lists would be very useful provided they are kept up to date.

A more active network requires some kind of medium for information exchange, e.g. through internet discussion groups, or through a newsletter which can be distributed either via the internet or more traditionally on paper. From our Nordic experiences, it seems that the interest for participating at least in a Nordic internet discussion group is quite low. Researchers seem to give priority to their many other duties. The Nordic newsletter, however, has achieved much interest as a “window” through which activities in the other countries, as well as in other fields of research, can easily be viewed.

In creating future international networks, the Nordic countries can offer to share the networking experiences acquired so far, including the publishing of a newsletter. Also, a centre for ecological agriculture is now established at the Swedish University of Agricultural Sciences. If funds can be made available, there is substantial interest from this Centre to establish international relations, e.g. through coordinating international network activities.

Ecological agriculture in the Nordic countries

	Denmark	Finland	Norway	Sweden
State support so far for research in organic farming	1993-97: 50 million DKK (US\$7.5 million)	"Last years", per year: ~5-6 million FIM (US\$0.9-1.1 million)	1989-94: 38,4 million NOK (~US\$5.3 million) 1995-96: ~14 million NOK (~US\$1.9 million)	1986-96, per year: ~10 million SEK (~US\$1.3 million) <i>Research & development:</i> 1986-99: ~39 million SEK (~US\$5 million)
Present and announced government support for research in organic farming	1996-1999: 117,3 million DKK (US\$7.5 million) <i>Research & development:</i> 1998-2001: 125 million DKK (US\$18.6 million) <i>Postgraduate education programme:</i> 7 million DKK (US\$1.05 million)	1997: ~5,9 million FIM (~US\$1.1 million)	1997: ~10 million NOK (~US\$1.4 million) 1998: 12,6 million NOK (~US\$1.7 million)	1996-98: 46,5 million SEK (~US\$6 million) <i>Research & development:</i> 1997-99: 45 million SEK (US\$5.8 million) <i>Postgraduate education programme:</i> 10 million SEK (~US\$1.3 million)
Chairs in organic farming	2; one of which in "Ecological animal husbandry systems" 2 associate professors	1 (presently filled only by 40%)	1 (to be announced in the summer/fall of 1997) 1 associate professor	1 1 associate professor

Comments to the previous table on ecological agriculture in the Nordic countries

The figures in the table are estimations. The aim is to give a general idea regarding the size of on-going activities.

Note that the figures represent *only government (state) funding*. There might also be private or semi-private funding in addition. For example in Sweden, the Government in addition gives money to a research fund administered by the Swedish Farmers' Cooperation, which for the last three years has supported a 2,4 million SEK project (US\$0.3 million) (in total), and is likely to support more organic projects in the future. In addition, for the next years at least 1 million SEK per year (about US\$0.13 million) will be spent on organic research by private organizations.

The intention has been only to include funding intended exclusively for organic farming. There may also be cases of funding given to e.g. "sustainable agriculture" projects, where organic agriculture can be included, or where organic projects are funded within ordinary research funding. Generally, such projects are not included in the figures presented in this table, although a few might be covered in the figures for the past years.

Another problem is to separate what are "research" projects as opposed to different types of development projects. Both headings are given in the table.

As for Finland, a new research plan for the next few years is now being discussed, and the future funding depends on how well the plan will be accepted by funding bodies.

Most figures are taken from the following report:

Höök, K. *Ekologisk jordbruks-och trädgårdsproduktion. Forskning i sju europeiska länder* (Organic farm and gardening production. Research in seven European countries) Swedish Council for Forestry and Agricultural Research.

The report is supplemented with personal communications.

The current exchange rate has been used when converting into US Dollars.

ORGANIC AGRICULTURE RESEARCH: STATE OF THE ARTS AND FUTURE PRIORITIES AND COMMENTS ON THE REPORT OF ELS WYNEN

by Urs Niggli

Introduction

Over the last twenty years, organic agriculture research has developed from very unconventional roots to a modern concept of research which increasingly influences the thinking of conventional researchers. The report of Els Wynen analyses this development very concisely, and I fully agree with her conclusions on how research could be supported by FAO activities.

Nevertheless, some additional information has to be given in view of the recent development in Switzerland, where organic agriculture is growing fast out of the niche.

The recent situation in Switzerland

In 1997, organic agriculture covers 7% of the agriculturally utilised area, 4500 farms have been converted or are being converted. Despite an annual growth of organic land area of 30 to 80%, the Swiss market for organic produce is larger than supplies. Whereas organic milk and milk products (cheese, yoghurt, etc.) are available everywhere, cereals, fruits and vegetables are imported from EU countries, Canada and USA (self supply of organic wheat is about 45% compared to 100% with conventional wheat). Therefore, agriculture and marketing experts forecast a further growth of organic agriculture of up to 20% within the next five years. Organic products are available in all retail shops. The two biggest supermarket chains of Switzerland (market share 65%) aim at having a full organic assortment and at increasing the yearly turnover with organic food of up to 500 million Swiss Francs each.

In addition to the optimistic signs of the market, the conversion rate is supported by annual subsidies by the Government. Organic farmers are subsidised per area of organically managed land, per ecologically diversified area on their farm (hedgerows, fallow land with wild flowers, extensive meadows etc.) and per livestock unit kept under appropriate conditions.

Impact of market growth on research activities

Even though the land area under full organic management and under conversion, the fast growing market for organic produce has created a much more favourable situation for research funding in Switzerland. A considerably higher amount of public funds has been made available for organic farming research. In addition, trading and processing firms as well as farmers' associations (e.g. livestock breeding, dairy and fruit associations) have provided money for R&D projects in order to develop and assure future markets. These changes in the funding policy of public and private institutions have induced increasing numbers of conventionally thinking researchers to begin organic farming research too, in order to save their jobs. Consequently, there is a certain risk that the complex and often time consuming interdisciplinary or even holistic approach of organic agriculture gets lost in research projects. Arguments over whether genetic engineering in plant breeding and food processing complies with organic farming ideas or not are clear signs of such changes.

To avoid a significant loss of holistic thinking in organic farming research, the establishment of scientific networks, training exchanges for aspiring researchers, sabbaticals for senior researchers and peer review of papers within the fast growing community is very important. Therefore, I support the recommendations of Els Wynen to set up a scientific network within FAO. Already existing networks such as the IFOAM Scientific Conference or the Conference of the German Speaking Scientists are very important. But because the organizing teams change for every conference (and in the case of the IFOAM Conference the venue can even be on a different continent), these opportunities do not have permanent communication structures and tools.

One of the most difficult tasks of a future network is to define the framework of organic agriculture research. If we agree on the fact that organic farming, as it is practised by the experienced farmers, is a paradigm shift in agriculture (Els Wynen, 1996), research objectives and methods should conform. A more concrete definition of the term holistic approach (does it mean interdisciplinary, multidisciplinary or non scientific?) could be a beginning.

Future priorities in organic farming research

Els Wynen in her report focused accurately on the objectives and issues of the research done during the last twenty years. But she did not put enough emphasis on the future research priorities. Some of these are listed below without further explanations:

- Holistic approach to animal health (integrating breeding/selection, housing/ethology, feeding and alternative veterinary medicine);
- technical progress in horticultural crops;
- development of low input and minimum tillage systems in arable crops;
- plant breeding without genetic engineering;
- ecological and socio-economic implications of regional conversion;
- filling the gap of knowledge on product quality;
- processing methods of organic food; and
- echo audit systems in organic agriculture.

THE PRESENT STATE AND PROPOSAL FOR FUTURE RESEARCH IN THE FIELD OF ORGANIC AGRICULTURE IN CENTRAL AND EASTERN EUROPE

by Józef Tyburski

Historical Background

Truly enough, in the inter-war period, organic agriculture in Poland was initiated but with the outbreak of World War II it ceased to exist. In that period, there were several farms which implemented organic methods. At the same time, a movement to propagate organic agriculture, led by Count Stanislaw Karlowski, started. A few courses took place and several instructional brochures were issued. In 1938, a Poznań-based Society of Promotion Principles of Life and Farming in Harmony with Nature was established. A periodical, "Biology and Life", of which four numbers were published just before the war, was an organ of the Society. Soon after the outbreak of the war, Count Karlowski was arrested and executed. His real estate was taken over by the Nazis and the organic (biodynamic) farming method abandoned.

As far as scientific life is concerned, between 1928-33, Bronislaw Niklewski published a few valuable papers on humus and composting.

During the post-war period, the development of Polish agriculture was deterred by the destructive state politics. Yet Polish farmers, as the only ones in Eastern Europe, withstood the state strategy of forced collectivisation. Thanks to this fact, an overwhelming 80% of farmland belonged to private owners. Being under difficult circumstances, the farmers thought about protecting the possessed land rather than introducing new methods.

Work on organic agriculture began after 1980, that was in the time of establishing Solidarity Trade Union and political changes in the entire Eastern Europe. In the 1980s, the idea of organic farming was promoted in Poland through lectures, meetings, discussions; among them five seminars on biodynamic agriculture were held by German specialists. After eight years of informal promotion, the Association of Ecological Food Producers, EKOLAND, was officially registered on 1 September 1989. At present, 236 farms with a total acreage of seven thousand hectares are EKOLAND-certified. Furthermore, the Lublin-based Polish Society of Organic Farming which was established in 1993, certified over 100 farms last year. In December 1996, the Association Agro Bio Test, which is a control body dealing with inspection and certification of organic farms, was established.

In other Central European countries, organic farming started to develop at the end of the 1980s with only the exception of Hungary where the Biokultura Association was founded in 1983. The process of certifying of organic farms began in Hungary on 1988, in Yugoslavia and Poland two years later, in 1991 in Latvia, a year after in Estonia, in 1993 in Croatia, the Czech Republic, Lithuania, Romania and in 1994 in Russia and Slovakia. The total number of organic farms in this region was about 1000 and the total acreage amounted to about 60 000 hectares (Soltysiak, 1997).

Completed and Current Research Projects

The first small-scale research projects on organic farming in our part of Europe were initiated in the second half of the 1980s. A lot of attention was paid to the method of biodynamic agriculture and particularly to sowing dates and their influence on development, quality and yields of crops. In the 1990s, this kind of research was abandoned and more interest was taken in the development of the biological method of organic farming.

I present here a review of the research activities in organic farming in countries of Central Europe.

1. BULGARIA

In the early 1990s at the Plovdiv University, an Agroecological Centre was established by Stoitcho Karov. Two graduates of the Organic Farming Department at Wageningen University are his co-workers.

2. CZECH REPUBLIC

J. Moudry in Ceske Budejovice leads research work on organic crop production with the emphasis on the relations between farming and the environment. Comparative studies on organic versus conventional farming systems were made at Brno Agricultural University.

3. HUNGARY

Laszlo Radics at Budapest University is working on non-chemical weed control. Geza Marai at Gödöllő University is working on animal nutrition in an organic agriculture system. Two Ph.D thesis were made on composting at the same University.

4. LITHUANIA

At the Kaunas Academy research is being carried out on the influence of agriculture on water quality (Vida Rutkoviene organized a conference on the subject in 1993). P. Lazauskas was working for several years on non-chemical weed control at the same University (P. Lazauskas is retired).

5. POLAND

M. Górný initiated a comparative study on organic versus conventional farming systems at Warsaw Agricultural University.

H. Runowski at the same University is running a project on economics of organic production.

J. Kus at Pulawy Institute of Soil Sciences and Fertilization is running comparative studies on organic versus conventional farming and a project on choice of crop varieties for organic systems.

J. Szymona made a project on crop nutrition at Lublin Agricultural University.

U. Soltysiak at Warsaw Agricultural University is working on legislation aspects of organic agriculture.

J. Tyburski and T. Sadowski at Olsztyn Agricultural University are working on weed communities on organic farms.

6. ROMANIA

Ion Toncea made his master degree in Wageningen and now he is in charge of the Research Institute of Cereals and Industrial Crops.

7. SLOVAKIA

In Piestany and Nitra, research work is being carried out on crop production with consideration of methods of organic and integrated farming.

8. UKRAINE

A few scientists attended an IFOAM conference held in Copenhagen last year which is proof of interest shown by the Ukrainians in organic farming.

Topics for Future Research

In our opinion, supported by our Hungarian colleagues, research in organic farming should be concentrated on:

- estimation of internalisation of environmental costs by organic farmers (its aim is determining the real cost of food production);
- the role of organic farming for the biodiversity conservation;
- farm-experiments versus plot-experiments methodology;
- research on pesticide residues in food (not only active ingredients but also their by-products);
- work on modern breeding methods without genetic engineering;
- work on choice of appropriate varieties of crops and breeds of animals;
- animal husbandry;
- animal nutrition;
- marketing strategies for organic products; and
- policy options.

List of scientists working on organic farming research:

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COMMENTS ON THE REPORT OF ELS WYNEN AND OVERVIEW OF THE ENOF RESEARCH PROJECT

by Raffaele Zanolì

A general comment is that the report is very welcome and quite thoroughly researched. It is very welcome because research in organic farming has only recently become an issue for major governmental and inter-governmental agencies and the level of funding is still below the minimum needs.

Nevertheless, in various European countries things are changing and the European Commission itself has sponsored a certain number of research projects on ecological agriculture, including two networks: one is named "European Network for the Coordination of Research in Organic Farming" (ENOF) and the other concerns the "Development of a Strategy for Cooperation and Optimal Documentation and Supply of Literature on Ecological Agriculture" (DOCEA). The latter has just finished and its second phase is being prepared.

By personal participation in both projects, I think that networks, although quite inexpensive compared to a proper research project, are a very efficient means for stimulating research and dissemination of results among the scientific community, although they do NOT provide a good means for extension and technology transfer to the farmers/producers.

Therefore, a FAO network on organic farming is welcome, but it should be coupled with adequately funded tools for extension and training, e.g. by means of pilot projects affecting precisely identified areas.

As an agricultural economist and participant in the EU-funded FAIR3 CT96-1794 project on "Effects of the CAP-reform and possible further developments on organic farming in the EU" (see Annex), I have some specific comments on some points of E. Wynen's report, concerning data and the importance of economic research in organic farming and subsequent training/extension to farmers:

1. *Data availability:* as is pointed out in the report "data on organic agriculture in the public domain is almost non-existent". This is why in our project we have dedicated a large amount of time to data collection and the building of an extensive database (raw data and literature) covering eighteen European countries. Economists are used to dealing with data collection and have specific tools for processing "bad" or "noisy" data. It is not strange therefore, that a lot of research projects concerning OF are run by economists.
2. *Comparisons:* What is stated in chapter 5.4 of the report is not completely acceptable. Comparisons are still very useful and provide the basis for system simulations which enhance the insights in our understanding of organic farming at work. A shift in the productive "paradigm" needs extensive comparison with the cost and benefits of the former mainstream paradigm. In economic research, particularly, comparison will still represent a very useful approach to the better understanding of organic farming. Less important for research, but more important for extension, are the studies concerning the conversion process, as stated at the end of the Second ENOF workshop held in Barcelona (Spain) in 1996.
3. *Methodology:* interdisciplinarity is crucial in organic farming, as is a holistic approach to research. Successful networking (as ENOF and DOCEA have proved) necessarily involves researchers from different backgrounds and disciplines. A future FAO network should not focus only on one discipline, although restricting the scope by choosing a single strategic topic to be approached by different points of view and disciplinary backgrounds (e.g. methodological issues, fruit and vegetables, cereals, cotton, etc).
4. *Food safety and food security:* these two issues seem to become central in the following years and their relationship with organic farming practices should be further investigated. These appear to be two very important issues for FAO too and quite apt to be approached in an interdisciplinary way.

In general, other important issues are connected with biodiversity preservation and the role of organic farming, as well as the issues raised by stockless organic farming. Organic farming has originated as a mixed farming system, but in some area has developed in a different way. The possibility of developing viable stockless systems is an important matter to investigate, especially in relationship to the development of organic farming in arid areas, where other sources of organic matter should be devised and in relationship to energy balances and food security.

In conclusion, however, research efforts should not only be concentrated in the technical areas, as economics and marketing are also crucial for efficient farming systems. This is not clear enough in E. Wynen's report. Farmers are to be seen as total entrepreneurs and not only as mere technicians: a lot of energy and nutrient waste and environmental damages could be avoided in the future if farmers develop their entrepreneurial abilities and better understand economic and market issues. This is particularly important for innovative farmers, as organic farmers are.

Sub-coordinator for legal and Economic Aspects ENOF
Permanent invitee to DOCEA as 'data consumer'
Founding member of GRAB-IT, Group for the Coordination of the Research in Organic Farming, Italy

Overview of the ENOF research project “Effects of the CAP reform and possible further developments on organic farming in the EU”³

Background

Organic farming is currently still a minor part of European agriculture, though in some countries it has left the niche it used to be in and gained acceptance of up to 8% of farms. Originally the system developed largely independently from specific policy influence. A recent emphasis in policy towards more environmental friendly farming practices and the importance of surplus reduction has led to more attention towards organic farming and the establishment of specific policy provisions. Of special importance in this respect is EC regulation 2078/92 (on agricultural production methods compatible with the requirements of the protection of the environment and the maintenance of the countryside). While the importance of this regulation is obvious there are other factors affecting the organic farming sector as well like the general CAP rules and the development of the market for organic food including EC-regulation 2092/91 which covers the certification of organic food. The resulting premium prices offer economic incentives for farms to convert to organic farming. While organic farming is a system that had developed with little input from state research institutions, the technology delivery system and the institutional setting of extension services become important with rapid development of organic farming.

Objectives

The general objective of the project is to provide an assessment of the impact of CAP-reform and possible policy developments on organic farming and thus contribute to a better understanding of the effects that current EU policies have on this sub-sector. This implies the objective of improving the understanding of the consequences future policy development might have on organic farming and on the contribution organic farming might be able to make to EU policy goals.

To accomplish the general objectives, the following detailed objectives must be fulfilled:

1. To describe in detail the policy and regulatory environment within which organic farming currently operates in the EU and some immediate neighbours, with specific emphasis on:
 - legislation defining and controlling organic production (EC Reg. 2092/91),
 - the 1992 CAP Reform (EC Reg. 1765/92 and others),
 - the accompanying agri-environmental measures (EC Reg. 2078/92),
 - the expansion of the EU to include Austria, Finland and Sweden,
 - other policies influencing organic farming directly or indirectly, and
 - direct support for organic farming in the Czech Republic, Norway and Switzerland (i.e. outside the EU policy framework).
2. To assess *ex post* the impact on organic farming of the mainstream and additional CAP Reform measures, as well as regulations defining and controlling trade in organic products and other relevant policies; and to assess the contribution of organic farming to current agricultural and environmental policy objectives. Specifically the impact of policies on organic farming and the contribution of organic farming to policy objectives will be assessed in the following areas:
 - 2.1 Number of organic farms, land area and enterprise structure;
 - 2.2 Market growth and development;
 - 2.3 Farm level and regional socio-economic performance;
 - 2.4 Environmental and resource use impacts;
 - 2.5 Output and public expenditure implications.
- 3.1 To develop a list of possible policy instruments suitable for influencing the rate of conversion, including an evaluation of their effects and of institutional prerequisites for an efficient implementation.

³ The research reported here is supported by the European Commission under contract FAIR3-1996-1794 “Effects of the CAP-reform and possible further developments on organic farming in the EU”. The views presented are those of the project participants and do not necessarily reflect those of the European Commission.

- 3.2 To identify institutional factors of political, economic and other nature suited for promoting conversion to organic agriculture by analysing the reasons for the major differences in the rate of conversion among EU member states and selected non-member states 1985-96.
- 4.1 To provide some realistic and up-to-date examples of farmers' reactions to policy options with a simulation approach that is guided by farmers and advisers.
- 4.2 To perform an impact assessment of different levels of adoption of organic farming on
- the structure of agricultural production;
 - agricultural markets (supply, prices);
 - income from agriculture;
 - nutrient balances in agriculture.
- 4.3 To use the scenario analysis technique to develop consistent scenarios of the possible future developments of organic farming (and respective policy options) by integrating all the available quantitative, semi-quantitative and qualitative information.
5. To draw conclusions from the results of the previous tasks and to provide policy recommendations

List of tasks and sub-tasks

- Task 1:** The policy and regulatory environment for organic farming in the European Union (coordination: P2).
- Task 2:** Impact assessment of current policies and regulations on organic farming and its contribution to policy objectives (coordination: P2).
- Subtask 2.1:** Number of organic farms, land area and enterprise structure (coordination: P2).
- Subtask 2.2:** Market growth and development (coordination: P3).
- Subtask 2.3:** Farm level and regional socio-economic performance (coordination: P5).
- Subtask 2.4:** Environmental and resource use impacts (coordination: P1).
- Subtask 2.5:** Output and public expenditure implications (coordination: P4).
- Task 3:** Institutional factors influencing the variation in the rate of conversion to organic farming in Europe 1985-1996 (coordination: P3).
- Subtask 3.1:** General overview including all EU member states and 3 non-member states (coordination: P3).
- Subtask 3.2:** In-depth study of selected nations/regions (coordination P3).
- Task 4:** Impact assessment of different levels of adoption of organic farming and policy options (coordination: P1).
- Subtask 4.1:** Farm level case studies (coordination: P1).
- Subtask 4.2:** Quantitative sector modelling (coordination: P5).
- Subtask 4.3:** Scenario analysis (coordination: P4).
- Task 5:** Policy implications and recommendations (coordination: P1).

Overall methodology

The structure of the project and some important connections between the tasks are highlighted by a flowchart (Figure 4).

A systematic understanding of the policy and regulatory environment of agriculture as far as it is relevant to organic farming (Task 1) is a prerequisite for the whole project, specifically for the work to be carried out in Task 2. Task 3 broadens the view and seeks to explain both the development of organic farming before the recent reform came into effect and the institutional and other factors that influence the spatial and dynamically differing conversion rates beyond the policy influence. These tasks set the stage for Task 4 which aims at assessing the impact an increased adoption (at different levels) will have and on the consequences alternative policy options will have. Subtask 4.1 provides a very close-up look on selected farms in order to demonstrate likely adaptations of organic farms to a changed policy environment and to generate hypotheses for the more macro-oriented approaches, especially Subtask 4.2. This subtask will adapt and develop existing quantitative sector models in order to fulfil the objective of Task 4. Due to the inherent limitations of such a quantitative approach, Subtask 4.3 uses the scenario analysis method to integrate and evaluate the results in a semi-

quantitative and qualitative fashion. Task 5 draws on all previous tasks in order to provide conclusions and policy recommendations.

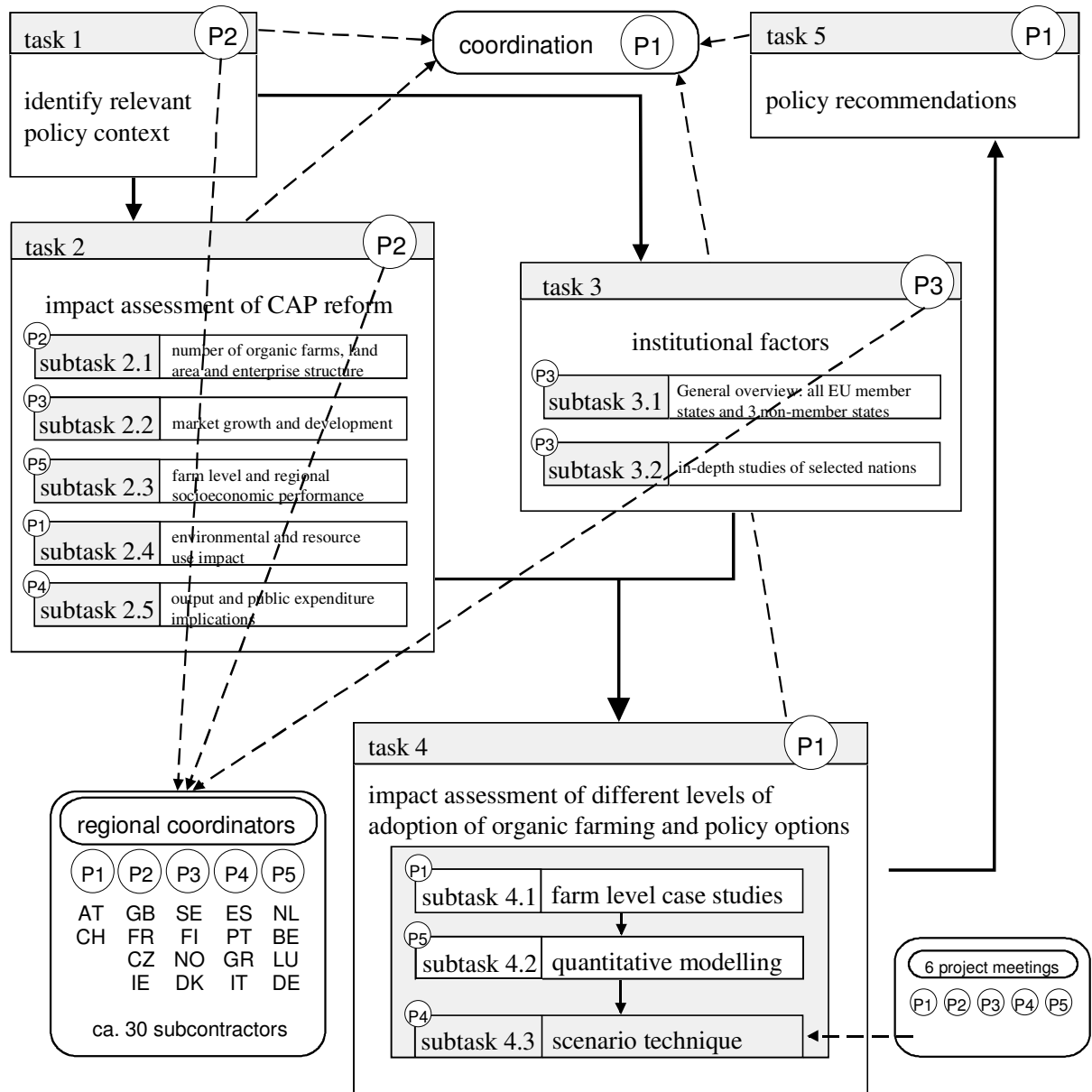
The project uses a mix of methodologies. Literature review and review of other materials will be performed according to the standards of the social sciences and applies to all tasks. Face to face interviews will be used according to established standards of empirical social research in a number of tasks. Interviews will use quantitative, semi-quantitative and qualitative questions. Modelling at the farm level combines a simulation approach combined with programming modelling techniques and uses local consultancy groups as an input among other sources. Quantitative sector models include programming models based on regionalised farms, a multi-product market model and a programming model differentiated by regions and farm-type. Existing models will be used and extended for project use. Scenario analysis is used as a tool to integrate the results and guide all other tasks during the course of the research project. The combination of modelling techniques with scenario analysis is innovative. Data collection and interpretation within Task 1 and Task 2 is an essential input to the modelling efforts and the scenario analysis.

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Project Duration: 1 March 1997 to 30 June 2000

Figure 4: Schematic overview on ENOF project tasks and work flow



Prepared by the project coordinator, 4 March 1997

ORGANIC FARMING RESEARCH IN THE NETHERLANDS AND COMMENTS ON THE REPORT OF ELS WYNEN

by Karin L. Zimmermann

Impression of agricultural research in the Netherlands

The Agricultural University of Wageningen has one professorial chair for organic and sustainable farming. The basic research contains technical research, but also research on environment and nature.

The Agricultural Research Department (DLO) is a central organization for fundamental strategic and applied research. Thirteen research institutes belong to this department which employs about 3000 people. LEI-DLO is one of them. The research includes a wide range of disciplines with expertise in several fields.

All research stations and research farms have an applied research programme and every station nowadays has technical aspects of organic farming in its research programme. There are special stations for animal, horticulture and arable farming. One research farm collects information by monitoring its organic arable farm management.

In the Netherlands an intensive network exists of advisers who translate the results of fundamental and applied research to different strategies of farm management, technically as well as economically. Until last year there was a team of eight advisers specialized in organic farming and conversion. Together with the farmer they made the plans for conversion and calculated the financial consequences of the decision. Starting this year, the eight advisers are integrated in the regular system of advisory teams to also transmit their knowledge to the advisers for conventional agriculture.

Consultants carry out research, but more important they advise and support the implementation of organic agriculture. Together with the agriculture advisers they form the framework for the first steps of conversion.

LEI-DLO is the main organization for socio-economics research in agriculture, horticulture, fisheries, forestry, rural areas and agri-business. Over 300 people are working at the institute. One hundred and twenty of them are senior and junior researchers. The fields of expertise are:

Accounting network: in the accounting network financial-economic and technical data are collected from holdings in arable farming, cattle farming, horticulture, fisheries and forestry. This accounting network is part of the Farm Accountancy Data Network of the European Union.

Business development: Just some of the research topics are farm-related environment protection, integrated production systems, intensive fruit production, management in sustainable dairy farming and perspectives for biological agriculture and horticulture.

Rural area and labour force: spatial policy in the Netherlands becomes more and more important. LEI-DLO does innovative research on valuation of nature and landscape. This type of research together with knowledge of agricultural labour force gives more insight into rural development.

Environment and energy: due to the intensive character of Dutch agriculture, much attention is paid to environmental problems. LEI-DLO has adapted the LCA-methodology. LEI-DLO also makes applications for agriculture and agri-business, of course for various production systems.

Market and technologies in agri-business: international market focus, efficient chain organization, product and process innovation and consumer oriented quality, shape the future of the agricultural sector and the food industry. Research on international competition, consumer behaviour and developing models for logistics and distribution is carried out by this institute.

International and national policy: international, national and regional agriculture policies determine the possibility of the agricultural sector and its agri-business, now and in the future. LEI-DLO studies policy effects with special models.

Organic research at LEI-DLO in agriculture and agri-business

Accounting network for forty organic farms

In the last 6-10 years, fifteen dairy farms, nine arable farms and twelve horticultural farms have been monitored in the accounting network. The way these farms are monitored does not differ from the way conventional farms are monitored. In the coming years, the number of farms will be increased to forty organic farms. These forty farms are representative of regions, farm sizes, farm characteristics, and so on. Last year, the first analyses were published. The subjects were farm income and farm labour compared to conventional farming.

Trade and consumption of organic products and food

In the past ten years LEI-DLO has done a lot of research into sector structure, trade and consumption of organic production and products. In the period 1987-1993, each actor in the chain from production to consumption has been the subject of research.

In 1996, research was carried out into the competitiveness of the Dutch organic agri-business compared to the organic agri-business in Europe. The aim of the research was to give the Dutch Government and the sector information on formulated policy to strengthen the Dutch position in the home market and the export market. In the Autumn of 1996, a second activity plan was presented by the Dutch Government based on the results of this study.

Policy effects and evaluation on a national and regional level

At present, there are two studies on policy effects. The first one calculates the effect on cost and income of the farmer if value added taxes and labour taxes are based on more environment-friendly criteria. The second study is on the effect on the environment, labour and water household if 10% of the agricultural farming land becomes organic.

Further research topics, recommendations and questions to E. Wynen's report

1. Socio-economic aspects of organic farming

Database of farm economics for farm management

Comparison of farm economics between countries with intensive organic farming.

Comparison of farm economics between conventional and organic farming.

Monitoring of organic farms to measure their performance and to estimate their strategic potential farm management.

Entrepreneurship and rate of conversion

Insight in management style, attitude and motivation of the farmer behind the decision of conversion.

2. Market-economics

Share of farm earnings in consumer prices

Consumer prices for organic products in various countries differ a lot from the rewards farmers get for their organic farm management. When the organic production increases, will the efforts of the farmer still be paid or will the prices be similar to conventional farming?

Demand and supply

The two farm strategies' cost efficiency or added value depends on the skill of the farmer, scale of production and region. If Europe is one region with different opportunities for production, the cost-efficiency strategy can be a serious motivation for conversion. What effect does scale have on cost-efficiency strategy and on the development of organic farming (cases in animal husbandry and fruit)?

Another topic is the scenario study for different directions of development of the organic production. How explosive will the growth of the supply become?

3. Rural areas

Food production/processing connected to regional production

A larger number of consumers and also traders have become more interested in tracing and tracking of the food. Food production and processing and regional production become more relevant. How does organic farming fit into this development?

Are there any opportunities to strengthen the position of organic production?

Nature management and organic farming

It is clear that nature management and organic farming could have similar goals.

What is the effect for the farmer when these two subjects are integrated into the national and European policy?

Some additional remarks to the following sections of the report:

5.4 Comparisons

In the Netherlands with the intensive agriculture systems, it is very important to reveal the economic possibility of organic farming. The organic organizations promote organic farming as a farm system equal to conventional systems. Additional income from preserving nature, house-selling or tourist facilities must not be necessary to get a family income.

5.5 Conversion

The skill of the organic farmer is probably 'higher' than that of the conventional one, anyway organic farming is more complex. It requires a great amount of time to market the organic products. Research on motivation in performance of the organic farm manager is initiated in the Netherlands.

5.6 Consumers

In the Netherlands the environment-issue is becoming less important. Taste and health as a motivation for purchase are more evident. These will be the items of research from now to 2005. Product innovation based on consumer preferences will be the main item in organic marketing in the next years.

5.9 Data and standards for data

From 1999, all EU-countries must collect data on organic farming (2091/92). At that point, more statistic material on the organic sector will be available. In the Netherlands, official statistical data will be collected from 1998.

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